

# We see the future of communications

(and it's looking good).

Some will tell you the future of communications is all about one kind of network.

We see a bigger picture than that.
(We're optimists.)

The future is about the Internet, data, voice, optical and wireless working together.

With unlimited potential.

We have the vision and know-how to give you the network you need. Along with the software and service to make it all work. Give us a call, We'd like that.

We make the things that make communications work."



## SCIENTISTS & THINKERS OF THE 20TH CENTURY

The Great Minds of the Century	64
Sigmund Freud by Peter Gay	66
Post-Freudian Analysis	
The Wright Brothers by Bill Gates	70
Beyond Kitty Hawk by Leon Jaroff	
Albert Einstein by James Gleick	74
Playing Dice with the Universe	
Leo Baekeland by Ivan Amato	
Ludwig Wittgenstein by Daniel Dennett	
Philo Farnsworth by Neil Postman	
Robert Goddard by Jeffrey Kluger	
Jean Piaget by Seymour Papert	104
A Century of Science	
The IQ Meritocracy by Nicholas Lemann	115
Alexander Fleming by Dr. David Ho	
Edwin Hubble by Michael D. Lemonick	
Kurt Gödel by Douglas Hofstadter	
John Maynard Keynes by Robert B. Reich	
How We've Become Digital	
Alan Turing by Paul Gray	
Who Built the First Computer? by Frederic Golden	
John von Neumann by Nathan Myhrvold	
Enrico Fermi by Richard Rhodes	
William Shockley by Gordon Moore	
Robert Noyce by Frederic Golden	
Jonas Salk by Wilfrid Sheed	
James Watson & Francis Crick by Robert Wright	
Linus Pauling by James D. Watson	
Ian Wilmut by Dr. Bernadine Healy	
The Leakey Family by Donald C. Johanson	
Where Anthropology Meets Psychology by Robert Wright	
Rachel Carson by Peter Matthiessen	
Tim Berners-Lee by Joshua Quittner	
Vannevar Bush: Hypertext Prophet by Frederic Golden	
Cranks, Villains and Unsung Heroes	
Putting Science to Work	
A Century of Science Fiction by Bruce Sterling	
What's Next? by Sir John Maddox	

#### MARCH 29, 1999 VOL. 153 NO. 12

#### THIS ISSUE

TO OUR READERS	6
CONTRIBUTORS	
AMERICAN SCENE: Online brides	.10
NOTEBOOK	.33
JOEL STEIN on the Holyfield-Lewis bout	40
WORLD	
ADVENTURE: Ballooning into History	.44
Two men make it around the world-and beyo	nd
THE BALKANS: On the Verge	.48
The Serbs mobilize, and NATO ponders bombing	
Kosovo: The army Milosevic will confront	49
JORDAN: An interview with Queen Noor	50
RUSSIA: The Prime Minister's wish list	52
NATION	

JUSTICE: Rogue Prosecutors When war on crime becomes war on the people CAMPAIGN 2000: Like Dear Old Dad's... There's a familiar look to George W.'s staff DISASTERS: Elegy for the City of New Orleans. CRIME: A Yosemite mystery deepens...

#### SCIENCE

ENVIRONMENT: Salmon at the Brink ...60 Can Seattle save the endangered species?

#### THE ARTS

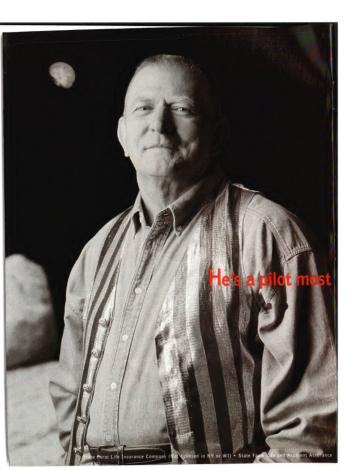
ART: John Singer Sargent's comeback	208
MUSIC: What's in Blur's future?	210
TELEVISION: Three new sitcoms	
CINEMA: Matthew McConaughey shines	215
BOOKS: Gail Godwin on millennium madness.	216
SHORT TAKES: A book, a play and a car chase	218
Q+A: Joey McIntyre keeps it real	222
PERSONAL TIME	

Q+A: Joey McIntyre keeps it real		
PERSONAL TIME		
YOUR HEALTH: Beating insomnia	22	
YOUR MONEY: The Dow at 10,000	22	
YOUR TECHNOLOGY: Help-line hell	22	
PEOPLE: A whole lot of feuding going o	n23	

COVER: Illustration for TIME by Mark Summers COVER: I MINISTRUMO (I/O T 100.6 Og/ NULLA CAUMTAN CAU

THE CONTROL OF STATE AND LETT THE PROPERTY HAS BEEN THEFT. I CONTROL OFFI THE PROPERTY OF THE







In the light-hearted vests his wife made him before every mission, he engaged in the serious business of sending mankind into space. Through the triumphant Apollo 11, the harrowing Apollo 13, and almost 60 other historic missions, Flight Director Gene Kranz set a standard for excellence that will never be equalled. His credo – "Failure is not an option" – helped 12 Americans walk on the moon, and gave the rest of us a future as vast as space itself.

## he never flew.

As we salute the men and women who played a significant role in the shaping of this remarkable century, State Farm is proud to be playing its role in helping millions of others make sure their families' futures will be even more remarkable. State Farm Understands Life.



## Thinkers vs. Tinkerers, and Other Debates



fourth of our TIME 100 special issues profiling the hundred most influential people of the century. We began a year ago by picking 20 leaders and revolutionaries, followed by

artists and entertainers, then business titans. Now comes our convocation of the greatest minds: this century's 20 most influential scientists, thinkers and inventors

Among the most interesting debates we had, especially with our outside experts, were those concerning the relative influence of thinkers vs. tinkerers-those who work mainly inside their own mind vs. those who turn their mind to practical things. In some centuries the tinkerers are more influential. The 15th, for example, was important for Gutenberg building his printing press and Columbus setting sail; the 19th for Fulton and his steamboat. Morse and his code, Bell and his telephone. Edison and his light bulb. But in other centuries the pure thinkers were more influential. The 17th, for example, boasted Newton, Galileo, Descartes and Locke.

Our century had its share of great thinkers. Einstein, most notably, was the greatest theorist since Newton, whose universe he overthrew. Einstein's ideas led to making the 20th a century of physics, one marked by manipulations of subatomic particles in ways that produced everything from atom bombs to silicon chips.

The other great theoretical breakthrough of this century was the discovery by James Watson and Francis Crick of the self-replicating structure of DNA. Their thinking may make the 21st century a century of biotechnology, one marked by the manipulation of DNA in ways that produce everything from customized drugs to human clones.

But our century will also be remembered for its brilliant tinkerers. The ability to transcend gravity, brought about by folks from the Wright brothers to Robert Goddard, affected the way we live as much as Einstein's ability to figure

WELCOME TO THE | out what gravity actually is. Philo Farns- | worth's ability to turn electrons into television images was likewise as influential as figuring out what electrons actually are. Indeed, our century may be noted most for those who went out to their garages (metaphorically, at least) and helped bring us televisions and transistors, plastics and penicillin, computers and the World Wide Web.

Often it was hard to pick one person to credit for a particular advance. Some cases involved famous rivalries, such as Farnsworth vs. Vladimir Zworykin over inventing television, or Jonas Salk vs. Albert Sabin over developing a polio vac-

great thinking is part of a continuous group endeavor.

Telling the story of science and invention through people has always been part of Time's mandate. In 1923, our first year, we did a cover on Frederick Banting, who helped isolate insulin, and the following year we did covers on Sigmund Freud and Leo Baekeland, who both made it onto our list this week. Science and technology have been particular interests of mine: this is the 40th cover related to these fields that we've done since I became managing editor 40 months ago

The TIME 100 series has become a true multimedia project. A CBS News special hosted by Morley Safer will air this Thursday, March 25, at 10 p.m. E.T. A panel with some of our experts was moderated by Charlie Rose for his PBS television show, which airs Monday, March 22. We have a place on our website (www.time.com) where you can express your own opinions. CBS Radio has been broadcasting short profiles on each selection. A book series is available (800-692-1133), and we are hoping to produce a coffeetable volume for Christmas. And Madame Tussaud's wax museum in London has just mounted an exhibi-

tion of our selections. Our next and last TIME 100 issue, looking at the heroes and icons who shaped our century, comes out this summer. Then we'll begin the daunting task of picking a Person of the Century. Comparing the impact of scientists with that of artists, leaders and heroes will be difficult. Even with the luxury of historic hindsight, it's hard to gauge who had the most effect. (Pop quiz: Who had more lasting influence in the 16th century, Shakespeare or Martin Luther, Magellan or Michelangelo, Eliz-

abeth I or the Mogul leader Akbar We realize there are no right answers. But we do believe that the process of thinking these questions through and hazarding an argument can be illuminating-and perhaps even enlightening. We







ALBERT EINSTEIN





1977

cine. Other cases, such as the creation of the atom bomb or the computer, involved a series of contributions. Although there is a danger in personalizing history, there is also an advantage. By choosing the people we feel were most responsible for key breakthroughs, and then exploring their relations and rivalries, we hope to convey the human excitement that makes real the progress of science. We created two gatefolds-a time line of the century's discoveries (page 109) and a chart of how computing and communications converged (page 141)-as a reminder that

# How to have a tax-free retirement.

#### MORGAN STANLEY DEAN WITTER

tanley Dean Witter is not a tax advisor. Investors are urged to consult with their personal tax advisors the effects of the new legislation on their situations as well as the tax consequences of any investmen

an Stanley Dean Witter is a service mark of Morgan Stanley Dean Witter & Co Services are offered through Dean Witter Reynolds Inc., member SIPC.

© 1999 Dean Witter Reynolds Inc.



SPECIAL ADVERTISING FEATURE

# rirst

They attend Cabinet meetings, romp with visiting heads of state and have full run of the White House. Presidential pooches are truly top dogs.



Perhaps the most famous White House pet, F.D.R.'s black Scottie, Fala, is said to have been photographed more often and received

more mail than Roosevelt himself.

A little white mutt rescued from an Austin, Texas, gas station, Yuki became President Lyndon Johnson's best friend and even taught L.B.J. to howl duets with her





Lucky, President Ronald Reagan's sheepdog, served only a brief term in the White House. When she became too big and boisterous, she was

removed from office and retired to the Reagan ranch.

Millie was a working mother. She had six puppies while in the White House, and her "autobiography" outsold President Bush's.





Bill Clinton's chocolate Lab. Buddy, is the latest in a line of canines that started with George Washington's 36 dogs.





CONTR UTOR



SCIENCE CLUB: Clockwise from left, Dorfman, Colton, Taraski, Elmer-DeWitt, Golon

PREPARING A SPECIAL ISSUE OF TIME LIKE THE ONE YOU'RE HOLDING TAKES CAREFUL planning. The biggest problem, says PHILIP ELMER-DEWITT, the assistant managing editor who supervised the project, is the issue's sheer size. "I realized straight off that if I had to edit 92 pages all at once, I'd burst," he says. So he, deputy chief of reporters ANDREA DORFMAN, and TIME's science staff began working on it nearly a year ago; by last fall their list of the greatest minds of the century had been boiled down to a few dozen names. In November Elmer-DeWitt began handing out writing assignments.

Deciding who got those assignments took some creative thought. Elmer-DeWitt was determined to find writers who brought a special expertise to their subject and could also produce graceful prose. NEIL POSTMAN for example, who wrote on TV pioneer Philo Farnsworth, is the author of Amusing Ourselves to Death, an acclaimed study of the impact of television on society. RICHARD RHODES, who profiled nuclear physicist Enrico Fermi, wrote a Pulitzer-prizewinning tome on the making of the atom bomb. Paleoanthropologist DONALD JOHANSON, who discovered the fossil called Lucy, had



COLLABORATING: Delessert, left, with Piaget in 1970

a long and bumpy relationship with the Leakey family and used this occasion to break a silence with Richard Leakey that lasted nearly two decades.

Some of the choices were more unconventional. At TIME's 75th-anniversary party last year, BILL GATES said his career was particularly influenced by the Wright brothers-so he was chosen to write about them. And though TIME senior writer PAUL GRAY is no computer ex-

pert, he was picked to tell the tragic tale of Alan Turing. Says Elmer-DeWitt: "I needed someone who could break the readers' hearts. Despite all the advance planning, we had to be ready to rethink the issue at any time. A few weeks ago, science-fiction writer BRUCE STERLING persuaded us that the century has been shaped as much by bad scientists as by good ones. We decided on the spot to

pull together the feature on "cranks, villains and unsung heroes" that you'll find inside. Finding just the right art for the issue was its own adventure. Deputy art director MARTI GOLON was looking for someone to paint Swiss child psychologist Jean Piaget, for example, when she chanced on a portrait in an illustration annual. She knew the artist, ETIENNE DELESSERT, as a children's book illustrator and thought, "Wow, this is a perfect solution." She had no idea how perfect. Delessert not only knew Piaget but had worked with him. Delessert sent along a photo of the two collaborating on a book, which we couldn't resist reproducing here. You will find other remarkable, often rare photos inside, thanks to picture editor JAY COLTON and assistant JESSICA TARASKI, along with visual treats of all kinds-charts, graphics and even what looks like a subway map. Use it to guide your own journey through the century. We hope you'll enjoy it as much as we did.



# Tempting

To Try And Stunt His Growth,

# Our Lamb

And Rice Formula

## Will Do





They sure are cute when they're little. Too bad they don't stay that way for long. On average, in a puppy's first year of life, he can grow up to ten times faster than a human. Yep.

ten, And this kind of growth demunds all the extra protein and other wholesome nutrients he can get. That's why we developed Parina O.N.E.' brand Papp, Formula. The first ingredient is real limits a great source of the protein your pappy needs. We also added brewers rice, which provides carbohydrates for energy, And Purina O.N.L. is highly digestible, so your puppy's growing body is sure to get every

bit of the tood's nutrition. So
while it may be hard to let your
little one grow up, just be glad you don't have to
buy him shoes. For more information or to receive
a special offer, call 1-800-787-0078, est. 2026.

PURINA O.N.E.



SECOND TO NONE





Having found their wives Elina and Tanya through loveme.com, Ron Redburn, below, and John Adams, far left, are their own most satisfied customers



Steve Lopez/Phoenix

## **Click Here for Love**

A Foreign Affair offers lonely hearts an electronic emporium of brides online

HEY WERE JUST AVERAGE Joes from Phoenix, Ariz., none of them married. Trying to figure out a way to make a nice follar in 1985. They already had good jobs, but they wanted something all their own, and being sharp lads, they knew this much: 1) good love is hard to find; and 20 the Internet has shrunk the planet, opening up a world of romantic options.

And so it was that John Adams, Ken Agee and Ron Redburn rented a little house on 24th Street and began an international dating service called A Foreign Affair, a.k.a. loveme.com. They ran ads in Russian newspapers asking women to send photos and vital statistics, and several weeks later their website debuted with 300 Russian princesses. Today they are the Manny, Moe and Jack of love. They have profiles of 6,500 women from 49 countries, dozens of clients have married, and they've hired six more employees in Phoenix and 20 in Russia. "It just took off," says Adams, whose love connection was one of the first to go online but who now faces a few hundred competitors

Elina Redburn, 26, left, and Tanya Adams, 29, found love and a brighter future online Let's say, for the sake of discussion, that you've struck-out. Maybe it's the belty over the belt or the hair that looks like a deforestation project. We have a support of the same and th

And not everyone is thrilled about it. Lonely-hearts clubs have been around forever, but the flashy electronic cousin of the mail-order bride catalog has led to as many as 6,000 marriages annually and raised a few eyebrows. Early this month, the U.S. Immigration and Naturalization Service sent Congress a report

recommending that there
be stricter regulation and that foreign women
be properly warned about the
potential for exploitation. Leni
Marin, of the Family Violence
Prevention Fund in San Francisco, says some matchmakers
market foreign women as obedient and submissive. "If
you're obedient, then you're a
willing sex slave," she says, or
so the pitch suggests.

But as women flee economic disaster in Eastern Europe, Asia and elsewhere, the hazards work both ways. Gerry Williams, a photographer for the Philadelphia Inquirer, brought home a mail-order wife from Russia in November 1997. Six months later, as he was leaving for Russia to do a

was leaving for Russia to do a story on the industry, his unhappy bride bolted. "She cleaned me out," says Williams. "She used me to get to America to meet a younger, richer guy." Adams admits there may

Adams admits there may be some shady operators but says any relationship is risky and notes that the INS found no more evidence of abuse among mail-order couples than among

public. "Our clients are bank presidents, educators, professionals of every type," he says. His company sells addresses (\$9 apiece for two, \$7 apiece for up to 13) and leads 11 tours a year to foreign socials, where men can meet the women they've corresponded with. "I've looked all around here and haven't found anyone." says Jeffrey Porter, 48, who owns a construction company in Crown Point, Ind., and shelled out \$3,500 for a July trip to St. Petersburg. "I want

someone to share a life with.'

There may be an easier way: set up your own introduction service. In November 1997, Redburn, 46, became the first of the three owners to marry a Russian woman he met through their website. Last month, after 18 months of courting, Adams, 37, became the second to take a Russian wife. Next month, Agee, also 37, will make it a trifecta. The combined ages of the three owners is 120, and of their lovely brides, 76. Love struck quickly, says

Redburn's wife Elina, who had an engineering degree in Russia and now works for her husband. Same for Adams' wife Tanya, who has a business degree. The women miss aspects of home but say good riddance to Russian men. Besides. It may take some improvising and networking, Tanya says, but it is possible to make good borseth in Phosphare to Dorseth in Phosphare to Dor



# TAKE CLEAR CONTROL. TAKE CLARITIN.



Talk to your doctor about once-a-day, nondrowsy CLARITIN for people ages 6 and up. One CLARITIN Tablet relieves your seasonal allergy symptoms all day without making you sleepy. CLARITIN is safe to take as prescribed; one tablet daily. At the recommended dose, CLARITIN is nondrowsy. The most common side effects occurred about as often as they did with a sugar pill, including headache, drowsiness, fatigue, and dry mouth. Call 1-888-833-0003 for more information and a \$5.00 rebate certificate. Or visit www.claritin.com Please see next page for additional important information. Available by prescription only.

#### **CLARITIN®** brand of loratadine TABLETS, SYRUP, and RAPIDLY-DISINTEGRATING TABLETS

RRIEF SUMMARY (For full Prescribins Information, see package insert.)

INDICATIONS AND USAGE: CLARITIN is indicated for the relief of nasal and non-nasalseasonal allergic rhinitis and for the treatment of chronic idlopathic urticaria in patients 6 years o

CONTRAINDICATIONS: CLARITIN is contraindicated in patients who are hypersensitive to this

PRECAUTIONS: General: Patients with liver impairment or renal insufficiency (GFR < 30 mL/min should be given a loaver inflaid dose 110 implement other data.) See CLINICAL PHARMACOLOGY Special Populations )

Loratatine (10 mg once daily) has been coadministered with therapeutic Drug Interactions uring indifficulties: Lorisonine 110 mg once away russ often coapmensistent winn third placific closes of enthromorphic membeliar, and leteroconagie in centrellad cinciant planmacology studies in addit violuntieres. Although increased pasma concentrations (AUC 0-24 his; of letratatine and their descarbotthom/oratatine were observed ofcroming coatmensishins on lorisonatine with each cital design in normal voluntieres (in = 24 in acch study), there were no chinically relevant changes in the drugs in normal violatiens (in 2-8 in cach study). These were no chincisty related changes in the saith profile of brindman as assessed by execution/deputient size, changes with a grain and debte of the changes of the control of the changes of th

Effects on Plasma Conventionurs, Aut. 5:24 hrs., of Europeanic und Descentivement, crossorie After

13 Date of Loaderinis	range , cultangene in Tight	
	Constating	Described buy quidadine
Enythromycan (500 mg 08th)	+ 40%	- 46
Cimetidine (300 mg 0(0)	+103%	+ 6%

There does not appear to be an increase in adverse events in subjects who received oral contra-

common and common designation, and impairment of feelings in an 15-mont conceptional of the common designation designation of the common designation designation designation designation designation designation designation desig Carcinogenesis, Mutagenesis, and Impairment of Fertility: In an 18-month carcinogenich

prises of the study.

Decreased feithly in male rate, shown by lower female conception raise, occurred at an oral dose of 84 mg/m, (approximately 50 times, the maximum recommended furnam dely crail dose on a rangilli basis) and ansi remersible with cession of dosen, but custation had no written on male or female female; present of the study of the study

20 limes the maximum recommenced furnant delay lord good core or a might "basis".

\*\*Preparation Cledery 9. There was no evidence of armal tradisported in statistics performed in rats and satisfies and offices up to 96 might (approximately 75 times and 150 times; respectively, the maximum recommenda human delay not dod on a might basis. There are invener on additionable shallow in greater and missing first account for missing the control of the control

Among Sulface Court (Authorities through a country proposed on the country pro

ADVERSE REACTIONS: CLARITIN Tablets: Approximately 90,000 patients, aged 12 and older received CLARITIN Tablets 10 mg once daily in controlled and uncontrolled studies. Placebo-controlled clinical trails at the recommended dose of 10 mg once a day varient from 2 weeks 10 months of working to my controlled from these trails was approximately 2% in

REPORTED ADVERSE EVENTS WITH AN INCIDENCE OF MORE THAN 2°, IN PLACEBO-CONTROLLED ALLERGIC RHINITIS CLINICAL TRIALS IN PATIENTS

	PERCEI	AT OF PATIENTS RE	PORTING	
			CLEMASTINE 1 mg BID	EO mg BID
	n = 1926	n = 2545	n = 536	n = 684
Headache	12	11	8	8
Somnolence	8	6	22	9
Faboue	4	3	10	2
Dry Mouth	3	2	4	3

Adverse events reported in placebo-controlled chronic idiopathic urticana trials were similar to

those reported in allergic rhinths studies.

Adverse event rates did not appear to differ significantly based on age, sex, or race although the

CLARITIM REDITARS (loratedine rapidly-disintegrating tablets): Approximately 500 patients ectioned CLARTIN REDITABS increases rapidly-distributions tables; in controlled clinical trials of tweeks distance. In these studies adverse events were smilar in type and frequency to mose seen with CLARTIN Tables and placebo.

Administration of CLARTIN REDITABS (toratedine rapidly-distribution) tables) did not result in

an microssed reporting requestry or mouth or forque remission.

CARFITH Symp. A Opportunitaty 2000 goodborn patients 6 to 12 years of age recried 10 mg locatadine once day in controlled christal that for a period of 915 days, shring these. 100 solition that the controlled christ patients of 915 days, shring these. 100 solition that the controlled christ patients of 915 days o

ADVERSE EVENTS OCCURRING WITH A FREQUENCY OF > 2% IN LORATADINE SYRUP-IREATED PATIENTS (6-12 YEARS OLD) IN PLACEBO-CONTROLLED TRIALS AND MORE FREQUENTLY

	PERCENT OF PATIENTS REPORTING		
	LORATADINE 10 mg QD n = 188	PLACEBO n = 262	2-4 mg BID/TID n = 170
	11 = 100	15 = 504	
Perropuspess	4	2	2
Winecomo	4	2	5
Fatione	3	2	5
Hyperx (1851)	ä	3	5
Andronnal Pain	8	3	0
		c1	9
Comprehishe			ė.
Dysphono.	4	<1	
Maraise	2	0	
Lipper Respiratory			

Tract Infection — a store a short is event in good allow in 2"n.) the following adverse events from the most office in 2 and the store patient of LABITIVE denied these events when the event for the contract of the store patient of LABITIVE denied these events when the event for the contract of the store and the event of the store that the event of the ev

mes, syncops, Lachylaridia

Central and Perspheral Menous System Biepharospasm dizzness, dysphonia, hyperfortia,
migrane, paresthesia, tremor, vertigo

Gastrontiestanti System Altered taste anorexia, constipation, diarribea, dyspepsia, flatulence,

gastres, hecup, increased appetite, nausea, stomatics, toothache, vomiting Microvinsiseleta Sixtem Arthratos mysfolia.

mitation insomas, irradianty, percental Reproductive System Breast pain dysmenorhea, mesonhagia, vaginitis Respiratory System Bronchitis, brienchospasim, coughing dysmea, epistaxis, hemophysis. taryngdis, nasal dryness, phanyngdis, sinusitis, sneezing Sion and Appendages: Dermatris, dry hair, dry skin, photosenstivity reaction, pruntus, purpura

OVERDISABE: In adults, somnolence, tachycarda, and headsche have been reported with over-doses greater than 10 mg with the Tables formulation (40 to 180 mg). Extragyramidal signs and pa-pitalisms have been reputied in challen with overdoses of greater man 10 mg of CLABETHA Syrup-in the event of overdosage, general symptomatic and supportive measures should be existingly

polentifys and mantament for air shorp an increasion.

The assume air overloodings results reasonably process of emessis (special sympo) except in patients with regulated assumed assumed as the regulated assumed assumed as a seasonable of the patients are assumed as a seasonable of the patients as assumed assumed as a seasonable of the patients as with anomal states. Same cattaintance may also be of value for rand displace of boxes cattained by Controlled son, of the Controlled on the Controll

Sold least the countries at their decision of the sold length of their and and their present than 2100 and 1200 times, respectively, the maximum recommended human daily oral dose on a regim? basis). Single local doses of locations showed no effects in rats, more, and montality at doses as high as 10 times the maximum recommended human daily oral dose on a regim? basis.



Rev 3/98

19628426T-JBS

CLARITIM REDITABS (locatedine rapidly-disintegrating tablets) are manufactured for Schening

Convenient © 1997 1998 Schering Corporation All rights reserved



# NOT SURPRISINGLY, FORTUNE 500° COMPANIES DEMAND A LOT. NOT SURPRISINGLY, WE DELIVER.

"We recognize that Las Vegas, along with being a premier destination, continues to provide us any and all amenities needed to produce a spectacular show."

Donald J. Schmid, Manager - Corporate Merchandising and Planning Daimler Chrysler Corp.

"Why Las Vegas? Exciting destination, great logistic support, large hotel blocks and favorable rates are some of the reasons we keep coming back."

Michael D. Damitz: Project Manager, Mobil Oil Corp

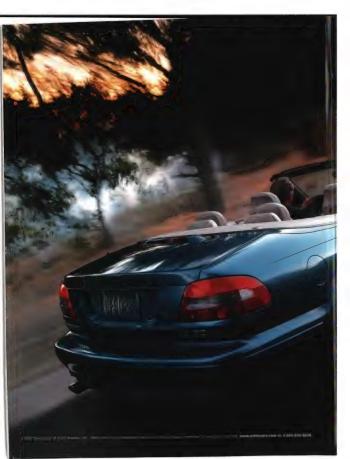
The contray's most successful corporations domaind quality in terry spect of their business. Meetings are no different with 199,000 rooms and more than 6 million square feet of space ritywide. Las Vegas has the facilities, flexibility and services to lice up to the demands of any corporate gathering.

In fact, our most demanding clients love that The Corporate Travel Index rates Las Vegas one of the country's best values. Add to that the cuterfainment.

you'll find Las Vegas meetings are some of the most well-attended.

We deliver great meetings for clients who demand them. Let us meet your demands. Call us at (702) 892-0711 or fax (702) 892-2824.





VOLVO

for life

AHHH...THE SUN, THE MOON, THE SIDE IMPACT PROTECTION.

VOLVO C70 CONVERTIBLE



DCBS EWS

# The TIME 100 Presents "The Greatest Minds of the Century"

Thursday, March 25 at 10 pm EST on CBS.

Brought to you by







Lucent Technologie





#### EDITORIAL DIRECTOR: Heavy Muller

EXECUTIVE VICE PRESIDENTS: Donald M. Eliman Ir., Elizabeth lials Long, Jan Helson, Joseph A. Ro

#### TIME

Founders: Briton Hadden 1898-1929 Henry R. Luce 1898-1967

DEPUTY MANAGENC EDITOR: June Nelly

EXECUTIVE EDITORS: Unput Manage In the Authority States

EXECUTIVE EDITO

ASSISTANT MANAGING EDITORS: Invasid vanious Para Linea Jedni Lar Condigner Projector Familia
INTERNATIONAL EDITORS: Divisid Monson plant. The disease Familia Clarges Para Care The American Titles Malerian Tool Facilities

International Editors: The American Titles Malerian Tool Facilities Facilities

Assistant Facilities

The American Titles Malerian Titles Facilities

Assistant Facilities

Assistant Facilities

Assistant Facilities

The American Titles Facilities

The Amer

SPECIAL PROJECTS EDITOR: no -- Seamen EDITOR-AT-LARGE: from commits
SENIOR EDITORS: Variet Agreed Armen -- Average Service (Gary Assert Large Renard-some Am guines larges 0 biols

ART DIRECTOR: ADMINISTRATIVE EDITION: DIRECTOR OF PHOTOGRAPHY: I CHIEF OF REPORTERS: ADMINISTRATIVE EDITION: CHIEF OF REPORTERS: INC. A

SATION WINTERS (for delivate Magnet came. Also came has been Const Stranger and have fast deliver a Construction for the Greenast Base chart depart came and who species of the Construction of the Constructi

WHITE REPORTERS: (not line) the line ten family from the line ten family forth line line family from the line family for family forth line seems (line) from the report forth line seems for family fam

CONTRIBUTORS is called bright bright from the contribution of the

At their diagnossessment to the planty from these finites and their action is used in their later than their States States Aspect, assent Lands, Committee Foundation of their Aspect and their actions of the States Aspect Aspects, assent Lands, Committee Foundation of their Aspects of their Aspects and Aspects and Aspects and Aspects Aspects and Aspects Aspects Aspects and Aspects Aspects

and being the fact many fitting by the Yest (see ) from the last of the least to find a few of the lea

mente in semant E. Lon. Standard A Distalle. Darid Malar for Physion insert from Standard Concess, and control search former control

And Action Actions Actions according to the Security of the Se

THE ONLINE: Lenix fauth littles, Makes Bandler and Makes Lenix Lenix Lenix Process (Section Melane Relative Lenix Lenix fauth littles and Makes Bandler Lenix Bandler Lenix fauth Lenix fauth Process (Section Melane Relative Lenix fauth Lenix fauth

The Control of the Co

SEADOLANTERS ADMINISTRATION, FOR THE COURSE AND ACCOUNT OF THE CO

PUBLISHER: The March March Water Vice PRESIDENT: Amend Godner Amend Godner Amenda Godner Amenda Godner Publisher: Selfand Amenda Godner Amenda Godder Amenda Godner Amenda Godder Amenda

CONSISTED AND THE CONTROL OF THE CON

Unrate par mod recept with "Recent right are best accepted about the decrease which are all about due to conso war are compared from the part of the p

TIME INC.

EXECUTIVE EDITORS: Isole fitniger, Issé M Ferrer III

EDITORIAL SERVICES: Sheldon Czapné (Shezhor Claste Bran Lebena Manager). Themas E Hobbert (Photo Lab), Lary Walden BicDonald (Research Centro). Beth Benon Ishander Nath Bose (Peter Cateston): Thomas Shern (Rechnings). Maryann Kornéy (Syndicaton). EDITORIAL TECHNOLOGY: Paul Jazzen Mice Proposed Lagener Caser (Sendicaton).



#### The Truth About Women's Bodies

#### 44When does your issue come out on typical men, featuring naked male bodies? I'd like a little beefcake too!

KATHY PTACIN Wauwatosa, Wis.

THREE CHEERS FOR "THE REAL TRUTH About the Female Body"—the most informative, most sensible and most informative, most sensible and most enjoyable piece on gender issues I've seen in a very long time [THE SEXES, March 8]. Barbara Ehrenreich, in her delightful way with words, punctures stereotypes right and left, revealing new subtleties in the ever fascinating dual sexuality of our common humanity.

common humanity.
RICHARD L. BRUBAKER
Chicago

EVEN THOUGH THEY MAY NOW BE CALLing themselves "femaleists," they're still singing the same old feminist refrain: "We're not inferior to men. If anything, we're superior (so stop oppressing us by forcing us into outdated, limiting sex roles, you chauvinist men)!" Enough already! Instead of wasting time and energy exploding what remains of the old sex-role stereotypes, let's move on to the more difficult and important task of creating new, updated sex roles. Do we really need to determine who actually did the hunting in prehistoric times or prove that women have it in them to be just as promiscuous as men?

ELLEN WEISMAN STRENGER Voorhees, N.J.

NEXT TIME, TELL US HOW A WOMAN'S brain works.

YOUR COVER LINES SHOWED A TYPICAL

RICHARD R. HOFSTETTER Plainfield, Ind.

bias: "The latest research ... reveals that women are tougher, stronger and lustier that anyone ever thought." Anyone? Some men, perhaps. Women have always known these facts.

KEITHA LEONARD Boulder, Colo.

WE WOMEN HAVE NEVER REALLY REJOICED about the elegance, the subtleties and the extraordinariness of our being. Men, individually and collectively, have always

known the real truth about the female being. And they have been guarding this secret for some time, even going to war to protect it. If we replace the word "body" with "being" when discussing both women and men, we can expand our attempts to truly understand each other's identity.

JEANNE BELOVITCH
Boston

THANK YOU FOR LETTING READERS KNOW that women are special but men aren't bad. Women aren't a weaker sex but, as you said, a separate one. It's extremely refreshing to read an article that points out qualities in one gender without bashing the other.

LAUREN KOTT Lakewood, Colo.

GOD HELP US! AMERICANS HAVE FINALLY discovered the female of the species!

JOHAN W. VIS

Tokyo

#### **COUNTING THEM UP**

Once again we're reminded that the volume of mail we get is not necessarily a valid gauge of how newsy a year has been. Despite the apparently endless nature of Monicagate and the presidential impeachment hearings, 1996 beat out '98 for total mail received at TIME. In part we suspect this was because of our controversial 1996 choice of Newt Gingrich as Man of the Year. Another factor: the huge amount of mail we got on our April 8 cover about the search for Jesus. Here are the totals for letters, faxes and e-mail aimed at our mailbox for the past three years:

1998	80	549
1997	67	670
1996	.83	,663

#### Sandra Hood Counsels Others To Improve Their Lives...

...before that, she was a Peace Corps Volunteer.



hile in the Peace Corps, Sandra "Sam" Hood helped villagers in Thialand improve their lives through agriculture and better health practices. Today, thanks to her Peace Corps service, Sam is also making a difference at home. She is a successful substance abuse counselor working with "at-risk" groups in Alaska.

Peace Corps Volunteers are changing America and changing the world.

For more information, call 800-424-8580 and press I at the prompt.



1. The state of th

We'll care for your great-great-grandchildren.





#### We're Pfizer.

We're developing the cures of the future. Spending over two billion dollars a year in search of the wonder drugs of the 21st century.

It is our greatest hope that someday in the future, you'll hear the announcement that cancer has been defeated, heart disease eliminated.

Alzheimer's eradicated. At Pfizer, we look to the future with the knowledge that the only thing incurable is our passion.



Life is our life's work.

www.pfizer.com

#### SOME COTTAGE-CHEESE THIGHS, PLEASE



The cover shot and photos illustrating Barbara Direnteich's report on the "femaleist revolution" (The SEXES, March 8) got a lot of comment—much of it negative. Many readers felt that rades pictures of women, however tastelly done, have no place in a general-interest magazine. A related retrial mass a response to the question, What is the real later than about women's bodies? Namerous readers school List and the control of the real later than about women's bodies? Namerous readers school List make the control of the control of

your cover!" "Some cottage-cheese thighs and a little respect next time, please," demanded Regina Morin of San Diego. But we did have a few fass of unillustrations. "Absolutely wonderful," wrote Chester G. Lob of Menio Park, Calif. "It is hard to imagine a more elegant display of strength and beauty without a hint of the levd."

WOMAN SHARING MAN'S GENETIC PREDIsposition toward hunting, humping and brawling? Sounds like the female anthem for the new millennium might go something like "I am woman—Hear me grunt, belch and scratch."

Don Holley Lafayette, Calif.

DID YOU GET YOUR IDEAS FROM WATCHing Xena: Warrior Princess? You say we are finding out so many new things about women, but there's really not much to hang your hat on here. If science doesn't back you up, you can just say science must be wrong! If reason doesn't back you up, no problem; women have for too long been held down by reason. You dight' allow for the chemistry between men and women, what happens when they get together. Without this essential chemistry, your theories fazzle.

T. PAIGE DALPORTO Charlton Heights, W.Va.

EHRENREICH'S DISCUSSION OF FEMALE aggression is well supported by a growing body of cross-cultural literature that

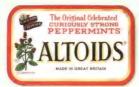
describes women's culturally institutionalized use of aggression, which may include physical violence. In some cultures female aggression in its various manifestations is considered an essential element of womanliness. In the U.S., the terms woman and aggression, when used together, often imply either female pathology of remale victimization. These cultural scenarios deprive women of their heroic accomplishment.

H.B. KIMBERLEY COOK Cultural Anthropologist Simi Valley, Calif.

PLAUDITS TO TIME FOR THE RIVETING report. From the time of Abraham, the Iews have traced their lineage through the female, and many cultures worldwide are dominated by women. Jamaica is a veritable matriarchal society that has the potential to become a model for the world. It boasts a national heroine: "Nanny," leader of the insurgent Maroons, military tactician and chieftain, who outsmarted the British in the 18th century. Ehrenreich's compelling "grandma hypothesis"-that children do better with a grandmother figure on the scene-is alive and well in Jamaica.

VALERIE FACEY Kingston, Jamaica

# REFRESHES YOUR BREATH WHILE YOU SCREAM.



THE CURIOUSLY STRONG MINTS

#### A Lesson to All Hate Groups

YOUR ARTICLE "A LIFE FOR A LIFE" ABOUT the racial-murder trial in Jasper, Texas, put me on the verge of tears [Nation, March 81. My heart went out to the families of both dragging victim James Byrd Ir. and his killer John William King. But bravo to the Jasper community for being strong in the face of evil and bigotry. Justice was served with King's being convicted of murder and sentenced to death by lethal injection. This should be a lesson to all hate groups, white and black. Americans want a change. If you want to hate, hate each other, and leave us alone. If you want to kill for initiation, kill each other, and leave us alone.

e us alone.

Karmen R. Alexander

Miami

BYRD WASN'T THE FIRST VICTIM OF RACIAL murder, and he won't be the last. We still

NED BYRNE Weymouth, Mass.

IT IS A SHAME ONE MAN HAD TO DIE LIKE an animal, and the animal who killed him is getting off with a humane death. I think real justice would be better served if king were killed slowly.

STEVEN M. DRUCKER Omaha. Neb.

#### THOSE MAD HATTERS

have a long way to go.



It was interesting to read "Mad About Hats," on milliner Philip Treacy (FASHION, March 1), but the last word on hat

pered more than 50 years ago The composer-lyricist Sylvia Fine got it just right in the song Anatols of Paris, which she wrote for her husband Danny Kaye for the 1947 movie The Secret Life of Walter Mility. Kaye played Anatole, an haute couture milliner who would "shriel with chic" when his "hat of the weel caused six divorces, three runaw horses." Fine ends the song with Anatole in a reflective mood: "And why do I sew each new chap with a style they must look positively grim in? Strictly between us. entre nous./ I hate women."

Maxwell E. Slegel Sussex, N.J.

# What does it take to become a genius?



To learn more about
"The Greatest Minds of the Century,"
check out the TIME 100 display
at your local Barnes & Noble.

BARNES & NOBLE

#### Not Likely to Pose a Hazard

WE WERE DISMAYED BY THE MANY Extremely misleading claims made in your article "Poisonous Plasties" (HEAUTH, March I). Numerous independent scientists have joined ranks with government agencies in concluding that the plastic softener used in medical devices is unlikely to pose a cancer hazard to humans.

This softener has been used for more to advance with no validated scientific evidence of adverse health effects in people. The Consumers Union study out cited found that migration levels of the softener used in food wrap are actually 1,000 times lower than the dose levels at which any health effect was observed in laboratory animals.

observed in laboratory animals.

In fact, according to our own estimates, a 150-lb. adult would have to eat more than 1,000 lbs. of cheese a day, every single day, to reach the observable effect level that was found in laboratory testing. To represent this one-sided advocacy as a health story was a disser-

vice to your readers.

COURTNEY M. PRICE
VICE PRESIDENT
Chemical Manufacturers Association

YOUR MITCLE USED SELECTIVE CITATION of the facts, diseased and omitted nonsupportive sources. The facts, vinyl medical products have been used safely for more than 40 years. They have been subjected to decades of testing, and they have consistently delivered reliable service under the most demanding conditions, such as discharged displays. You should have quoted the Food and Drug Administration on this issue. The FIA does not see this sa a

other medical authorities whose views were not included in this piece.

MARK A. SOFMAN MANAGER OF INDUSTRY AFFAIRS Vinul Institute Washington

matter of pressing concern, nor do many

#### Clarification

TIME BEGERTS THAT OUR REPORT ON Concerns about plastics did not include the observations of scientists and public health groups that have found no significant risk of human health effects from the use of plastic softeners. We should have made it clear that the fears about ill effects are countered by strong evidence to the contravy.

#### **Evil Isn't Canceled Out**

DIBECTOR BLA KUZAN IS LUKE NAZE PIAMmaker Leni Riefensthil: a great rists
who did bad political deeds [CINEMA,
March 8]. His art doesn't cancel to the
evil he did in naming names of people
who were involved with the Communist
Farty. Your writer Richard Schiede
made the wrong argument in favor of
Kazanis honorary Olear. Schiedel-maker
keep to the communist of the communist
restriction of the communist of the communist
restriction of the community of the community
resists easy mornizing. The right argument is that Osean should be about one
at and entered the community of the community of the community
and the community of the community of the community of the community
maker the community of the community
maker the community of the community of

MITCH GART Bedford, Mass.

NAMED NY PATHER, FILMANASEL, LON HUNCH, SEPTER HE AND SEPTER HE HOSE UP. American Activities Committee: Those who were named before the committee at having been communists had their careers ruined Was Kazan a great director? Without a doubt. But should be be warried as special Oszar? Althout he mention of his name by Kazan and others was enough to end his career in teleparation of his mane by Kazan and others was enough to end his career in teleparation.



years. Thousands of others were victimized by those with whom Kazan actively sided. What might their achievements have been had they not been named?

TOM HURWITZ Cinematographer of Dancemaker New York City

BIBLICAL PRECEDENT SUGGESTS A COMpromise for the Kazan award dilemma. Present the great director with an Oscar that has a head, torso and legs of gold but feet of clay.

I. DANIEL JOHNSON Camden, N.I.

#### Redesigns for Nissan

IN "NISSAN CALLS FOR A TOW" [BUSINESS, March 1], your readers were given a blurred snapshot of our company. Some of the positive steps we've taken were overlooked. Over the past year, we have restructured the way we do business in North America, and we are making substantial progress. We agree with your assessment that Nissan's new Xterra suv is "hot," but it is hardly "alone." By March 2000, Nissan will have redesigned virtually all its vehicles. including the flagship Maxima. We have a solid lineup of cars and trucks, a strong

#### TIME'S EXTENDED FAMILY



magazine show This Sunday and onday, a gripping tale of switching sides, how a drug dealer teamed up one of the country's largest cocaine rings.

with a DEA agent to crush On CNN March 28 and March 29 at 10 p.m. (E.T.)

o are the most imp tant people of the 20th century? Tell us your top pices at time.com

daily

Internet service on the World Wille Web

analysis at time.com plus live interviews at

Top tech news, features and our bargain hunters Deal of the Day at mon lettally

group of dealers and a parent company committed to the U.S. market. Nissan has been here for 40 years, and we're only planning to get better and stronger. MICHAEL J. SEERGY

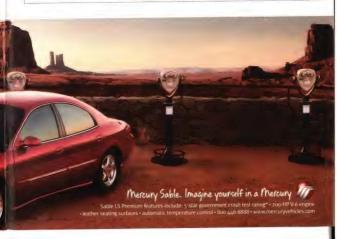
VICE PRESIDENT AND GENERAL MANAGER Nissan North America Carson, Calif.

I BOUGHT A NISSAN 200SX IN 1979 AND never learned to live with its rear end, which fishtailed all over the highway in slick and rainy weather. And the astronomical cost of replacement parts finally finished whatever predilection I had for Japanese cars.

WILLIAM ORR Picayune, Miss.

#### Ready to Run?

HILLARY CLINTON WOULD MAKE A SUPERB Senator (NATION, March 1) should the electorate of Arkansas choose to bestow the honor upon her. Representing New York, however, would be contortionism in true Clintonesque style. She has not shoveled New York snow or paid New York taxes. She has not earned the right to represent the people of New York. STEPHEN P. SCHAEFER Rochester, N.Y.



#### **Bringing Back Ho Chi Minh**

CALIFORMA SHOPKEPERR THUONG: WAS TURNS display of a poster of Viet Cong leader Ito Chi Minh may be insensitive (AMRICANS ESER, March 8); but he is perfectly within his rights to dow. Those states, and the state of the control of the states, and the control of the control of the states, and the customs they brought from their Asian homeland. An individtion of the control of the customs the proton of the customs they brought from their Asian homeland. An individeven when used to promote unpopular thoughts, must be protected.

FRANK S.C. CHANG Los Angeles

ON BEHALFOR MY PELLOWNETERIANS WHO can no longer speak. I ask those who back Tran's freedom of expression not to confuse free speech with acts of treason and inciting a riot. The communists are very adept at creating unrest and then using our laws to further their cause.

> JERRY MAZENKO Garden Grove, Calif.

#### Mouseketeer Who Made Good

AT FIRST I LAUGHED ATTER READING YOUR item about my husband Bobby Burgess, which lababed hum a "Bad Mousekeleer" because he spent 21 years dureing on March 51, Hink you acceledly insent to the control of the property of th

KRISTIE BURGESS, MOUSEKEWIFE Los Angeles

LETTERS TO THE EDITOR should be addressed to TIME Magazine Letters. Time & Life Building, Recklefeller Center. New York, NY 10020. Our fan number is (282) \$2258819 Correspondence should include the writer's full name, address.

Our e-mail address is Letters@time.com

#### SUBSCRIPTIONS and BACK ISSUES

For subscription queries or to order back issues, call Tit

#### REPRINTS and PERMISSIONS

For custom reprints (minimum order 1,000), please call 212-522-1779 or E-mail reprints@time.com. To request permission to make photocopies, call 1-500-311-TIME and request document 1000. A form will be fassed to you

TIME

Amy Musher's MAILBAG

IT WOULD BE EASY TO THINK THAT A MAGAZINE read by a gazillion people might have a strictly businesslike relation with its readers, but if you did, you'd be wrong. The connection we have is much more like that between old friends who know that despite all the nagging annoyances, letters can still be written.

and they will still be read, no matter how cranky they may be. So what makes our readers testy? Here's a sampling of what gets their goat.

► WHEN THEY FIND WORDS IN TIME THEY DON'T KNOW: One reader calls them "élitist bomfogs"—whatever that means.

### Test Your Knowledge

Go Head to Head with the Pros

Match some recent head scratchers with their definitions.
Maybe this sample sentence will help:

The quotidian comity of the wonkathon in the managing editor's conference room was shattered utterly when one senior editor caused a kerluftle by bloviating freely on the hidden beauty of the Jerry Springer Shose.

1 quotidian B upset
2 bloviate C crate windily
3 comity D everyday

hason & athertrad & Jases

4 wonkathon E thinkfest
5 kerfuffle

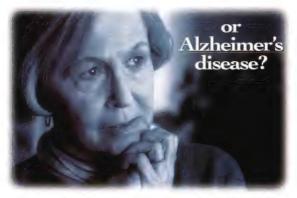
when some pages go unnumbered: 'If there was some consistency about the lack of numbers,' wrote one frustrated reader,' I wouldn't mind so much. If yours was the only publication that practiced this insame policy, I wouldn't mind. But there isn't, you aren't, and I do. 'The reason for this irritant, in a nutshelf, is that our magazine's ad content can vary from region to region of the country, leaving us unable to

put numbers on those pages that don't appear in the entire circulation run. Trust us on this; we're not trying to add needless chaos to your life.

WHEN ANY OF THE CLINTONS APPEAR ON THE
COVER: Since 1989 there have been 39 covers
with at least one Clinton as the newsmaker de la
semaine. Readers cried uncle long ago, begging us
to give them a break. No such luck. But considering that those stories generated more than 27,000
letters over the same years, we think we've seen our
share of retaliatory thrusts. Nah, we know we have



## Is it just forgetfulness...



#### • Memory loss • Asking repeated questions • Trouble using words

When signs like these begin to affect everyday life, they may not be a part of normal aging. They may be signs of Alzheimer's disease, an incurable, progressive illness that robs patients and their families of a lifetime of memories.

Today, however, the outlook for many is becoming more hopeful. ARICEPT\* is a clinically proven, once-a-day prescription medicine available to treat symptoms in patients with mild to moderate Alzheimer's disease. Already, over 625.000 patients in the United States have begun ARICEPT\* therapy.

ARICEPT\* is well tolerated, but some people do experience side effects like nausea, diarrhea, insomnia, vomiting, muscle cramps, fatigue, and loss of appetite. In clinical studies, these effects were generally mild,

temporary, and went away with continued ARICEPT use; 2% of people taking ARICEPT experienced fainting.

Only a doctor can evaluate symptoms such as forgetfulness and diagnose Alzheimer's disease. Speak to a doctor **tokny** about the benefits of ARICELYP in treating Alzheimer's disease.



TODAY'S TREATMENT FOR ALZHEIMER'S DISEASE

To learn more, call toll-free today. 1-888-999-9616 est. 91

Disase too additional important newtral information on accompanying page

#### People at risk for ulcers should inform their doctor.

#### ARICEPT | donepezil HC| 3-MO AND 10-MO TABLETS TODAY'S TREATMENT FOR ALZHEIMER'S DISEASE

WARNINGS AMERINESIS ASICSE ation during anesthernal Cardiovascular Conditions: Persus

ring your page and the page of the page of

a history of estimal or open active preferancy is some of necessary in page through the prescribes with underboared preferance Proteins: Ducy draws protein such preferancy is some preferance of the programme of the proteins of the protei

by Ayosemide, Digition and warrann Effect of ARICEPT" on on Mechabolism of Other Drags: No in wise clinical thats have investigated the effort, on metabolism by CVP 3A4 (id. colarade the enables of by CVP 2D6 (ig. effort).

type Effect of Other Drugs on the Metabolism of ARICEPT': Kelocensis

d when chalmesterase inhibitors are given concurrently with succiny chalme, similar or chalmergic agonists such as bethanester . Carcinsgenesis . Hutagenesis

Table 1	Comparison of Rates of A Titrated to 10 mg/day Ove	dverse Events in Patier or 1 and 6 Weeks	nis
	No hirefune	One week	Six-week

	The state of		Stration	tifration	
Adverse Event	Placeno page 5181	5 reptin (a.g.)	10 mg lar, ,=315;	C opto	
Nousea	6.0	81	19%	- Co-	
Same	5%	8-	151-	95	
value.	6%	F-	191-	F14	
Empu	370	41.	811	Src.	
Vaniday	28	(2)	85	8%	
Victor Enemps	19	84	8	200	
Ameny	2%	2.	The .		

Adverse Events Reported in Controlled Trials | to even

Body System Adverse Event	Placebo (n=355)	ARICEPT* (n+747)
Percent of Patients Willi Any Adverse Event	72	74
Body as a Whole		
		1,0
The Street of the Control		
Sec. Sport		
Catagor	3	8
Cardiovascular System		
		- 2
Digestive System		
No. or or		- 11
Section	5	10
2000	- 3	5
2 200		1 1
Hemic and Lymphatic System		
titue en chepanicalism		4
Metabolic and Nutritional Systems	1	
Western and Meaning of Street		3
Musculoskeletal System		_
Management of States		1
A1000		2
Nervous System		
Mericus System	6	· u
The state of the s		
	-	1 2
, epie T		
	1 - 2	
	_	

abii Other Adverse Events Observed During Clinical Trials ARICEP1\* has been administ

most housest detirectors. Cardinananular System: / would hyperferitor

Digestive System: Free

Mescalopheletal System: / /A

Skie and Appendages:

Special Serges:

Province 1.3 and 1.6 of VERDOSAGE Because strategies for the management of overdous are cent imported to the service of the se







#### VERBATIM

44 You could hear children scream, 'Where is my mom?' You could hear parents scream, 'Where are my children?' 77

> MELISSA WATSON, 14. survivor of the train crash in Bourbonnais, Ill.

441 honestly don't know what she'll decide, but ... she was complaining that it's impossible to get a decent bagel in Washington. 77

PRESIDENT CLINTON. on Hillary, at the Radio & TV Correspondents' dinner

4 Over all, you would have been better off last year if I had regularly snuck off to the movies during market hours, 77

#### WARREN BUFFETT.

chairman of Berkshire Hathaway, to shareholders in his company's annual report

44 He looked like he was the college president of the University of Mars. 77

> PAUL BEGALA, former Clinton adviser. on Steve Forbes



KINGS OF THE HIGH FRONTIER Balloonists Bertrand Piccard and Brian Jones complete a global voyage that has eluded many more famous men, with a little help from the Breitling Orbiter 3. Look how far a little hot air can take you!

#### LOSERS



JUAN ANTONIO SAMARANCH **Embattled Olympic Committee** prez wins vote of confidence-and Don King wasn't even involved

**EX-PRESIDENT GEORGE BUSH** Opted for stock in lieu of an \$80K honorarium. A year later it's worth \$14 million. Touché, Dow!

**BROWNIES** Science supports medicinal use of marijuana. But it's still shrewder not to inhale THE REV. HENRY LYONS Baptist leader resigns. Apparently God doesn't help those who help themselves to a Rolls-Royce

**MAJOR GENERAL DAVID HALE** Sentenced to pay \$22,000 for adultery and lying, plus 100 push-ups for crying in public

TIM JOHNSON

Blue Jays manager ousted for telling tales of his Marine days in Vietnam. He never went



#### CAMPAIGN 2000

#### **Hillary Hears Strains of** The Music She Will Face

TO SCANDAL COGNOSCENTI, THERE WAS nothing new in the headline last week that **KEN STARR'S** chief deputy once drafted an indictment against HILLARY CLINTON. But the confirmation by prosecutor W. HICKMAN EWING, coming at the outset of Whitewater figure SUSAN MCDOUGAL'S trial for contempt, sent chills through the First Lady and those advising her as she considers a run for a New York Senate seat, sources say As a sign of things to come, says one, "this most recent news gives you pause.

The case against McDougal, along with the June 14 trial of Hillary's former law partner WEBSTER HUBBELL, are certain to stir all the old questions about Hillary's own



Hillary Clinton

ethics. Her name was mentioned no fewer than 36 times in the indictment against Hubbell last fall. But despite the new signal of how bumpy a ride she may face Hillary headed off to North Africa no closer to a decision, an adviser says. "She's exactly where she was four weeks ago." -By Karen Tumulty/Washington

#### SECRETS, PART TWO

#### **Another Case of High-Tech High Jinks?**

AS IF THEY WEREN'T IN ENOUGH TROUBLE for letting the Chinese steal nuclear secrets, the national labs are about to get blasted for some high-tech appropriation of their own. In the past six years, Lawrence Livermore National Laboratory has raked in \$3.5 million in commercial license fees-and many millions more in government contracts-for a new ultra-wideband "pulse" radar that can peer through walls and spot Stealth planes. Former Livermore researcher THOMAS MC EWAN filed his first patent for "micropower impulse radar" in 1993, for which he was named "Distinguished Inventor of 1994."

The problem is, McEwan wasn't the

Larry Fullerton

first to invent the technology-if he invented it at all. It was first patented in 1987 by LARRY FULLERTON, founder of Alabama-

based Time Domain Corp., and featured at a 1990 Los Alamos meet-

ing attended by McEwan and his Livermore associates. In response to a Time Domain challenge, the U.S. Patent Office has initially rejected Livermore's key patents. Next month the House Science Committee will release a report that, sources tell TIME, will cite more cases of intellectual-property infringement committed by the weaponsmaking labs as they scrambled to find new raisons d'être in the post-cold war -By Arnold Mann/Washington era.

SECRETS, PART ONE

guidance systems for

"smart" munitions,

missiles and fighter

#### The Fallout from **Nuclear Leaks to China**

U.S. CUSTOMS COMMISSIONER RAY KELLY is adding agents and money to his agency's strategic-investigations unit because of Chinese efforts to smuggle out advanced U.S. weapons components and know-how. Last month agents thwarted China's second attempt to obtain military gyroscopes used in



Ray Kelly

aircraft. More customs cases are under way involving Chinese efforts to pilfer so-called critical technologies, FBI counterespionage specialists fear that the problem of spying isn't confined to Chinese visitors to the national labs. The FBI is taking a hard look at activities by scientists from several other nations. most notably Iran. For some years, Iranian scientists have visited the labs for exchanges that are ostensibly peaceful and beneficial, such as counterproliferation talks. Still, security at the labs has been so lax that FBI officials now want to find out if the Iranians or other foreigners picked up arms-related information on the sly. -By Elaine Shannon Washington





#### Who's .com-ming the world?

Today, it's ".com" this, ".com" that. You're more than a little familiar with

"com." But how about the company behind it?

businesses like Music Boulevard to portals like Excite. And with our Java" technologies, we're extending the Net-all the way to consumer

devices. By .com-ming every-At Sun, we've been taking comthing from smart cards panies into the Network to cell phones to Age for the better home appliances, part of 16 years. Everything we make, everything we do (and everywe're ushering in a whole new world thing we've always of interaction.

And that's what ".com-ming" is all about.

done) is about network

computing

Our computer systems, technologies and services enable companies to get to the Net, and .com their business processes. From ISPs like UUNET and EarthLink to entertainment companies like Sony. From e-commerce

behind them, hundreds of companies, some decades-old, some hours-old, are .com-ming themselves overnight. Reinventing themselves overnight

With our technologies

We're the dot in .Com. What can we .com for you?



## **But Yeltsin Only**

tled Russian President Boris Yeltsin have leveled five damning impeachment charges against him. If true, the accusations could raise him to the status of communist forefather Joseph Stalin.



o waged "genocide" against Russians by pursuing economic policies that impoverished the country

o used unnecessary force against hard-line lawmakers (had parliament buildings shelled) in 1993

allowed Russia's military to disintegrate ordered botched

1994-96 war in Chechnya o instigated

breakup of Soviet Union in 1991

**Purges After He Drinks** MUNISTS HOPING TO OUST EMBAT-



a caused famine that killed millions by demanding grain quotas larger than nation's total crop

o used unnecessary force on hardline communist Leon Trotsky (had him murdered with an ice pick) in 1940 o purged higher ranks of military, creating a shortage of military expertise

ordered botched pact with Hitler in 1939

o negotiated breakup of Germany after WWII



In This Town It Doesn't Hurt To Have God On Your Side





### **Easter Ain't Just** For Bunnies ...

HE POPE HAS RELEASED A CD AND AN MTV-ready video. The Christian Tattoo Association is already 100 members strong. And God seems to be taking a tougher stand in his marketing material. An anonymous donor has financed a series of 18 billboards in Florida and four other states, with decidedly in-your-face messages not unlike those of New York City's Marble Collegiate Church. The Brits go further, with a campaign that compares Jesus to Che Guevara. Easter 1999 may be remembered as the time God said, "No more Mr. Nice Guy.



#### CANDIDATE TRUTH



HONEST, AL Presidential mendacity is not a pretty sight. To nip it in the bud, we at Notebook pledge to keep an eye on the presidential candidates, rating their less than truthful statements from slight exaggeration ( /) to whopper ( ///// ). First up: Al Gore

STATEMENT **4** I was a small-business person, a home builder.

44 I'm a Vietnam veteranone of the lucky ones.77

4 I lived on a farm ... [My father] taught me how to clean out hog waste with a shovel and a hose.77

66 I took the initiative in creating the Internet.97

REALITY

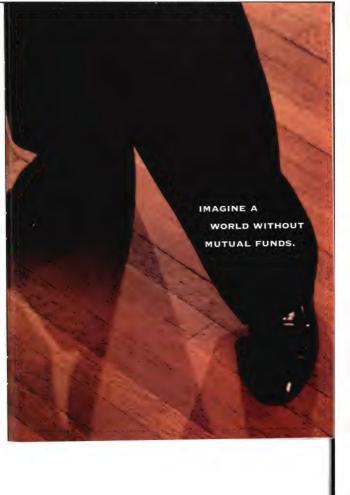
Nine houses were built by Gore's company. He was also working as a reporter and studying at Vanderbilt University at the time

Gore spent five months in Vietnam-as an Army reporter. So he was indeed luckier than most.

For most of his youth, Gore attended private school in Washington, where his father was a Senator. He spent summers and holidays on his

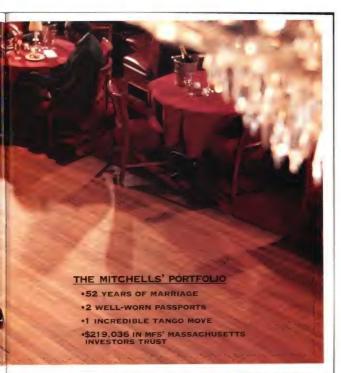
family's farm in Carthage, Tenn.

Gore was an early advocate of the information superhighway. But the Internet was invented in 1969, the year he graduated from college.





YEARS AGO, MFS INVENTED THE MUTUAL FUND. OUR UNPARALLELED EXPERIENCE
HAS HELPED INVESTORS BUY NEW HOMES. SEND THEIR KIDS TO COLLEGE.
OR, AS IN THE CASE OF DON AND PHYLLIS MITCHELL, RETIRE COMFORTABLY. COUNTLESS
PEOPLE ARE CLOSER TO THEIR FINANCIAL GOALS BECAUSE THEY'VE INVESTED IN MUTUAL
FUNDS. AND, BECAUSE MFS INVENTED THEM. TALK TO YOUR FINANCIAL ADVISER ABOUT HOW
YOUR FUTURE CAN BENEFIT FROM OUR PAST OR CALL US AT 1-800-811-9485.



IF YOUR FAMILY HAS A HISTORY WITH MFS THAT YOU'D LIKE TO SHARE, PLEASE CALL US OR VISIT OUR WEBSITE AT WWW.MFS.COM.

A diseased a source of one countries photometer, south is those and experim. If any VM production is distinction and interesting that of contribution of the source for the contribution of the contribution o



#### INFI STEIN

### **Boxing Advice from the Hulkster**

ON KING IS A GOOD AND RIGHTEOUS MAN. ANYTHING in this column that implies otherwise is the result of poor grammar or was lipped in by my editors after 1 went home. The important thing to remember is how good and righteous I think Mr. King is. Also, in case it comes up. 1 like the Scientology.

On March 13, Mr. King promoted a heavyweight title fight between Lennox Lewis and Evander Holyfield that resulted in a draw. While it appeared to the untrained eye that Lewis

beat the living daylights out of Holyfield, landing 348 punches to Holyfield's 130, the expert judges thought it was superclose. A grand jury is investigating the matter. I suggest a censure resolution. But only because I think that makes me sound smart.

A long-drawn-out trial would be bad for the country. Though it would be worse for the country if the jury decided that Lewis won. Any American getting beat up by a British guy is devastating. I once spent an afternoon with Lewis, and we are lunch in hotel room, and he drank tea. There

were moments when I'm pretty sure I could have taken him. I don't think the fight was fixed. Because if it was, the fixers did a really had job. As the World Wrestling Federation has taught me, a good fixed fight starts with two guys yelling at each other and usually involves thrown chairs, a choke hold given by a guy outside the ring and, for reasons I don't understand but find of printy, a screaming, scantilly dressed woman.

I didn't actually watch the fight because I no longer patronize boxing. The last fight I watched was in 1996, when I

went to Madison Square Garden to see Riddick Bowe, a black American, fight Andrew Golota, who is a plumber in Poland. Early on, in a moment I can't really explain, I told my friend that it would be "fun to sit with the Polish people." For the next half hour we sang Polish songs and chanted Polish chants. Nationalism is a blast, even if if is no typur own county.

But when "An-jei Co-la-ta," as we affectionately came to know him, was disqualified and a race riot broke out, we were out of there faster than you can spell solidarnosc. Or at least

than I can.

When I had tea with Lewis, I asked him why I've seen white fans boo black boxers for not throwing enough punches. He insisted that the crowds aren't racist, just full of bloodlust. He's right. I had hoped that after the Golota bout, civilized people like me would realize this and abandon boxing for nobler pursuits. Like watching cattight-

ing lesbians on Jerry Springer for free. But it's only now that columnists, commentators and fans are talking about boycotting the sport. Even Hulk Hogan, who knows something

about prearranged outcomes, told me he was disgusted by the Holyfield decision. "Any boxer who fixes a fight," he said, "should be hung in the backyard by his toenails for a couple of weeks."

Boxers have been knocked unconscious, paralyzed and even killed in the ring. Last month I met Muhammad Ali, who didn't talk as we sat silently eating chocolate-chip cookies. And the thing that finally made people disgusted with the sport was bad judging?

#### HOUSING

BAD LANDS Even in these flush times, prison populations are at an all-time high. Is this what they mean by Southern hospitality?

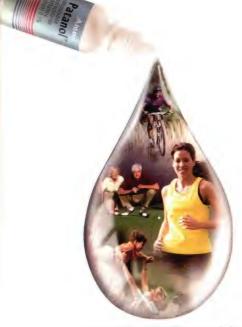


TIME. MARCH 29, 1999

#### PLAYBILL



NEVER-ENOING STORY Feet as if life lacks dram now that Monica's off on the book loue? Feet not. Monica the article weeks abouted. The State theatrical weeks abouted. The State of the lack and the state of the stat



A drop of Patanol. A million prescriptions. Relief for allergy eyes everywhere.

Just one drop of Patanol works in minutes to give your itchy allergy eyes 8 hours of relief. And, it's the #1 prescribed allergy eye drop.

Some people may experience side effects like a headache, burning, or stinging. Take your contacts out before use.

How much relief can a drop of Patanol give you? For more information, ask your doctor or pharmacist, call 1-888-PATANOL, or visit us at www.patanol.com



Works in minutes. Lasts 8 hours.

#### Patanol®

(olopatadine hydrochlonde ophthalmic solution) 0.1%

#### Information for the patient

Please read the complete information before you start using PATANOL. Don't share PATANOL with anyone else

#### What is PATANOL?

PATANOL (olopatadine hydrochloride ophthalmic solution) 0.1% is a prescription eye drop for itchy eyes due to allergies. PATANOL is a unique product that works in minutes to relieve your itchy allergy eyes for 8 hours.

#### Who should use PATANOL?

PATANOL is recommended for people who suffer litchy eyes due to allergens such as pollen, pollution, dust or animal dander. PATANOL has been shown to be safe and effective for adults and children 3 years and older.

#### How should I use PATANOL?

Use one drop of PATANOL in each itchy eye two times a day, approximately 8 hours apart. Care should be taken not to touch the tip of the bottle

#### How should I store PATANOL?

PATANOL is for topical use only.

Keep the bottle closed when not in use. Store the bottle at room temperature.

#### What other things should I be aware of before using PATANOL?

PATANOL should not be used by patients with a known hypersensitivity to PATANOL.

Are there any special concerns for women?
If you are breast-feeding, pregnant, or intend to become pregnant, you should discuss the

### use of PATANOL with your doctor. I wear contact lenses and my eyes are red.

What should I do? You should not wear your contact lenses when your eyes are red

#### I wear contact lenses. Can I use PATANOL?

yes, you can use PATANOL at least ten minutes before putting in your contact lenses or when you take them out.

What are possible side effects of PATANOL? In patient studies when PATANOL was compared to a solution without the drug, there was no difference in the overall occurrence of side effects. The most frequently reported side effects for PATANOL were headache (7%) and burning and shipping (< 5%). PATANOL has been shown to be safe and effective and has been used by thousands of patients.



ALCON LABORATORIES, INC. Fort Worth, Texas 76134



Put this card in the hands of a child and there'll be no room for a gun. A needle. Or a knife.

It's only a piece of paper, but that ittle membership card has helped keep millions of kids " ""." gangs and in school. To learn now would an help the Roys & Girls Clinks

call: 1 - 8 0 0 - 8 5 4 - C l u b .



The Positive Place For Kids



SENTENCED. LEROY SCHWEITZER, 61. leader of the Freemen, the antigovernment, anti-black and anti-Jewish group best known for its 81-day

standoff with law-enforcement officials in 1996; to 22% years in prison; on charges including bank fraud and illegal possession of firearms; in Billings, Mont, U.S. District Judge John Coughenour, who said he wanted to send a "loud and clear message to those who pass this hatred...around," also handed stiff sentences to six of Schweitzer's comrades.

RECOVERING. LOUIS FARRAKHAN, 65, controversial leader of the Nation of Islam; from prostate-cancer treatment and the flu; in Chicago. He plans to take a four-month sabbatical from the organization.



DIED. ERNEST GOLD, 77, Vienna-born Oscarwinning composer who wrote scores for It's

a Mad, Mad, Mad, Mad World and Exodus, among other films; of a stroke; in Santa Monica, Calif. Gold. broke into Hollywood in the mid-1940s, writing music for low-budget movies for Columbia Pictures.

DIED, MARVIN KRIEGER, 78, U.S. World War II fighter turned judge at the Nuremberg trials; in San Diego, Calif. After retiring from the Army in 1971 with myriad honors, including a Bronze Star for his role in the D-day invasion, Krieger taught law at the University of San Diego.

DIED. HARRY CALLAHAN, 86, innovative photographer who celebrated the ordinary; of cancer; in Atlanta. Callahan got his start in photography when he joined the camera club at his then workplace, Chrysler Motors. The selfeffacing Midwesterner soon took to

> memorably, his wife Eleanor. Influenced by Ansel Adams and Alfred Stieglitz, Callahan infused his images with stark lines and contrasts. After teaching at the Bauhausinspired Institute of Design in Chicago, he ran the

shooting city streets, clouds,

pedestrians and, most

photography arm at the Rhode Island School of Design (see Appreciation.

below).



\$9 million Total amount spent on pre-Oscar media blitz by studios whose films were nominated for Best Picture

\$1.619.58 Amount the studios spent per member of the academy

\$300 Cost to manufacture a 13-in. Oscar statuette

\$1.585 Cost of a one-year academy membership, two top-price seats for the awards, plus a limo for 10 hours

\$600 Average annual income in the Philippines



11 million Pints of Guinness drunk worldwide on St. Patrick's Day

1.63 billion Calories in 11 million pints of Guinness

1.98 billion Calories in 11 million cans of A&W root beer



48% Elderly in West Virginia who report having lost all teeth-the highest percentage in the U.S.

13.9% Toothless seniors in Hawaii

proes: AP USA Today, Los Angeles Darly News. World Vision









"When I think of HARRY CALLAHAN: the love of a magnificent woman; purity and love of the earth as it is." —Irving Penn, March 1999



# **Around the World in**

After two decades of failed attempts, a balloon sails into history with the help of technology and the weather

N THE NOVEL AROUND THE WORLD IN Eighty Days, Phileas Fogg employed all manner of transport-steamers. railways, yachts, carriages, trading vessels, sledges and even elephants. But no balloon. It was Hollywood, not Jules Verne, that sent the intrepid Brit off in that aircraft. Trivia, you say? But there was nothing trivial about the real-life fulfillment of what seemed to be quixotic fantasy last week in Northern Africa. In a 180-ft.-high balloon, a silvery dare in the air, two adventurers-Swiss psychiatrist Bertrand Piccard, 41, and British balloon instructor Brian Jones, 51completed their tour of the world in 20 days. The stakes were different (a purse of \$1 million, courtesy of Anheuser-Busch, as opposed to £20,000 in Verne), but their intent was the same. They sought to prove a point-to themselves and the world. The Breitling Orbiter 3 crossed the fin-

ish line (9.27° west longitude) over Mauritania last Saturday. Piccard was ecstatic: "I am with the angels and just completely happy," he said over satellite relay. Jones, for his part, said calmly, "I am going to have a cup of tea, like any good Englishman." They had sailed into history. And they decided to sail on a little more. "We do not land. We go to Egypt," Piccard radioed air-traffic control in Senegal. "We are a balloon flying around the world." "I will be tearing their eyes out when I see them." their erstwhile rival Richard Branson, founder of Virgin Atlantic, told TIME. "But apart from that, I think a hug and a bottle of champagne will be appropriate.

Since 1981 there have been nearly 20 attempts to circumnavigate the globe in a balloon. Steve Fossett, a Chicago million-



READY, MATE? Jones, right, stepped in to accompany Piccard on the ride of their life

aire who attempted the feat five times. plunged into the Coral Sea after traveling 14.236 miles last August. And on Christmas Day he went down again near the coast of Hawaii, taking along his partners, Per Lindstrand of Sweden and Branson. The U.S. Coast Guard fished them out at a cost-to taxpayers-of about \$130,000. Setting the elusive record was worth the trouble to Fossett. "I can't tell you how it ranks with the others, like climbing Mount Everest or making the first transatlantic airplane flight," said Fossett. "But it's one of the great explorations.

It's tough for pioneers to make a name for themselves these days. Both poles have been reached, the Atlantic has been crossed and recrossed, and the eagle has landed. So why not do it in a balloon? Well, what can

you say about a pastime whose first passengers were, in an experiment by the French Montgolfier brothers in 1783, a duck, a rooster and a sheep? No wonder Piccard has a complex. "The way the public sees it is this," he explained before lift-off. "If we don't leave, we are idiots. If we do leave but don't succeed in our mission, we are incompetent. But if we do succeed, it's because it was easy and anyone could have done it."

But you see, the psychiatrist has a legacy to uphold: his grandfather Auguste was the first to reach the stratosphere in a balloon, and his father Jacques dove to the deepest point of the ocean in a bathyscaphe. "Bertrand believes it is his destiny to fly a balloon around the world," said his rival Andy Elson, as the Orbiter 3 pushed the world record further and further.



Control panel

Pressurized cabin

Keeps the two pilots comfortable in the extreme

cold and thin air of the upper atmosphere

Carbon dioxide is removed from the air with

Brian Iones was the Mr. Fix-It of the expedition. He was quietly overseeing the construction of the gondola for Cameron Balloons when he was nominated to be a reserve pilot in the Breitling attempt. "Of course, reserves in any activity assume they will always remain reserves," he says. But he found himself, as he puts it, "in the hot seat" when Piccard had a falling out with his first co-pilot. Tony Brown, "He's not an adventurer," says Joanna Jones of her husband. "He's a professional pilot who approaches things in a judged manner." Jones quickly fell into a comfortable rhythm with his copilot. Brian "made me a cup of tea while I was preparing his bed," said Piccard.

As pioneering craft go, the Breilling Orbiter's outclasses the Niña, the Pinta and the Santa Maria—and the Spirit of St. Louis, for that matter. It is a high-tech combination of hot air and gas, equipped not only with simple necessities like a bunk, toilet and desks but also with a fax machine and astellite telephones. The journey began on March I, Piccard's birthday, in the snowcapped mountains of

Chiteau-d'Oex. Switzerland. Piecard and Jones cruised toward fluly at an altitude of 21,000 ft. crossed over the Mediterranean at night and enjoyed a meal of emu. On a satellite phone, Jones chatted with his wife, who spent most of her time at mission control at Geneva's Cointrin Airport, which was manned around the clock by a meteorologist and an air-traffic control of the cont

The pilots headed toward Morocco, over Mauritania and then turned northeast to catch a jet stream blowing toward India. In theory, balloons can't be steered, but pilots improvise by dropping up and down between different altitudes in search of the right wind nattern. Like surfers trying to eatch a wave, balloonists try to ride jet streams, high-altitude currents that usually move from west to east. "It's magical what pilots can achieve," says balloonmaker Don Cameron. "In competitions with hot-air balloons, they'll set a target 10 miles away and ask pilots to drop a marker on it, and the pilots will get within a meter of it." The Orbiter 3 crew hit its target on the fourth day of the journey and sped along in a jet stream at 60 m.p.h. They ventured outside the cabin once, when the balloon descended to 10,000 ft., so that Piccard could chip away at ice that had formed on the cables and the capsule. There were few surprises, and the only irritant was a mysterious buzzing in the cabin. On Day 5, Piccard located and dispatched-its source: a stowaway mosquito

by a bank of solar

panels suspended

from the balloon

TRME Dunwares by the Lecture

On March 7 Piccard and Jones heard of



China. On March

10 the Beijing gov-

ernment allowed

the Swiss-licensed Breitling access to

its skies, so long

as the craft staved

south of the 26th

parallel. Never-

theless, morale on

the Orbiter 3

started to flag

soon after, as Pic-

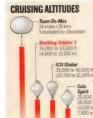


mi. (16,674 km)

a misfortune-and it was good news for their quest. On that day their competitors, the British team of Andy Elson and Colin Prescot, ditched over the Pacific Ocean. After setting an endurance record of 17 days, 18 hrs., 25 min. aloft, the duo, in

the Cable & Wireless balloon, was knocked out by what amounted to a one-two punch. First, peeved that Branson's December flight had infringed upon its airspace, China denied entry to his countrymen, forcing them to follow a more convoluted route. And then, while traveling over Thailand, Elson and Prescot were hit by a thunderstorm that shredded their balloon's envelope. They survived, after

a harrowing dunking in the Pacific Piccard and Iones had better luck with





(19,300 km)

card and Jones flew over the endless expanse of the Pacific Ocean, Progress toward Hawaii was slow, and they lost contact with mission control for four days. "I realized that the worst desert wasn't made of sand but of water," Piccard said when communications were re-established. Then the balloon popped out of its jet stream over Mexico and drifted in the wrong direction. They were using up precious fuel without making much headway. Even worse, a



404 mi. (19.962 km)

plummeted 46°F. Both pilots were exhausted, and Piccard had to resort to self-hypnosis to calm himself. But the duo pulled it together in the homestretch. Catching a 100-m.p.h. jet stream over the Atlantic all but assured victory. At its end.

Verne's novel asks of Fogg: "What had he brought back from this long and weary journey? Nothing, say you?" The names Piccard and Iones may not strike the same chords as Columbus or Magellan or Lindbergh or Armstrong. Indeed, last weekend's achievement is literally lighter than air. But Piccard and Jones have won the last world-spanning contest of our era. And now they are history. -Reported by Kete



TIGHT QUARTERS Jones and Piccard, right, shared a warm rapport and the bed (in shifts)



# **Ready to Rumble Again**

Milosevic chooses defiance over compromise, and the military situation in Kosovo deteriorates

By JOHANNA MCGEARY BELGRADE

ENSIBLE PEOPLE WOULD SIGN THIS agreement. The 81-page peace document on the table in Paris may not satisfy the full ambitions of either side in the Kosovo struggle, but it offers advantages all around. While it doesn't give the Albanian Kosovars the independence they crave, it would afford them three years of breathing room under international protection to practice being a state. After that, they could come back to negotiate or fight for full freedom from Serb rule. While Slobodan Milosevic would have to swallow Kosovar autonomy and NATO peacekeepers in

side his territory, he'd get out from under a hard-to finish war that earns him international opprobrium, and he'd retain ownership of land regarded by Serbs as the heart of

their nation. But we're not dealing here with entirely sensible people. The whiff of superpower attention went to the head of Kosovo's Albanians as they savored their first steps onto the world stage, prolonging the negotiations and frittering away pressure that was supposed to be reserved for the Serbs. Milosevic bathed in ego gratification as the world's diplomats trooped to his door. Both sides seemed to think. Why not keep this game going?

the first to see sense. Their upstart army.

Last week the ethnic Albanians were

ON THE VERGE Serbs have moved 40,000 troops int or near Kosovo HUNGARY

the K.L.A., had won international confirmation of its meteoric rise to pre-eminent power in the would-be state. By appearing to be willing to give up their arms and dream of independence in exchange for a strong Western umbrella, the Kosovars could show up Serb belligerence. It was smart tactics: if the Serbs refused to go along, the Kosovars wouldn't have to give up anything. So the ethnic Albanians sat down and signed the deal.

But Milosevic? His delegation came and went each day in Paris demanding pages of impossible changes, then kissed off the plan entirely as a "fake document." In the streets of Belgrade. Serbs reiterated their attachment to Kosovo but secretly believed a lastminute deal would be made to ward off NATO bombs. Not until Thursday night did Serbian state television even begin to hint that the threat of air strikes was growing real. And somewhere, burrowed into the rooms of the old Tito residence he rarely leaves, Milosevic was mulling over his difficult choices.

In one sense, the Serb strongman was exactly where he most likes to be-at the pivot of an international crisis. He has built his career, as biographer Slavoljub Djukic puts it, by being both pyromaniac and fireman-igniting crises, then convincing people that only he can put the fires out. But the Kosovo conflagration he first lighted in 1989-by stripping away the rights of the ethnic Albanians who make up 90% of the province's population-is proving tricky to

MONTENEGR

put out. Now he faces a perilous calculus: Is it riskier to cave in to Western demands or to suffer through air strikes?

Like other dictators of this age, Milosevic makes these calculations in virtual isolation. He rarely appears in public, never travels anywhere. He nominally consults an inner circle of perhaps 15, but his only true adviser is his ambitious, neocommunist wife Mira Markovic. "His pride at being a guy everyone comes to is huge," says a Western diplomat. "But his purpose is to throw people into confusion

No dictator ought to be able to survive after he has brought his country to ruin the way Milosevic has. Yugoslavia's GDP is half what it was in 1989; more than 25% of the workforce is fully unemployed; and the country is deep in debt. Says Mladjan Dinkic, coordinator of a group of independent economic reformers: "Whenever people start to realize how bad things really are. Milosevic creates a new crisis to

paralyze them Those who know the Serb leader best say he is perfectly capable of sacrificing Kosovo when the decision makes political sense. Even as the Paris talks foundered. most in Belgrade believed he would find a way to back down. But in Washington, officials feared Milosevic had already opted to let bombs fall. By last week he had massed some 40,000 Serb troops along the borders-hardly an optimistic sign. The allies may undertake another run at diplomacy to give Milosevic a last chance-yet another one-to retreat. But Milosevic may have decided limited

bombing is in his best interests.

Pentagon officials are less sure it is in theirs. While President Clinton thundered last week about NATO determination-"If we and our allies do not have the will to act, there will be more massacres," he said Friday-the Pentagon's top brass went to Capitol Hill to raise some questions. "Will the strikes achieve an end?" Marine Commandant General Charles Krulak asked. "What happens if Milosevic doesn't come back to the table? What if he uses this as a reason to attack? What is the endgame?' Says a Navy officer: "He can just say no-no matter how much pain we inflict

So the Clinton Administration is falling back on the same weak rationale it offered for the December air strikes on Baghdad: the purpose is not to bomb Milosevic into submission but to cripple his military so he can't devastate Kosovo. "We hope," said a Pentagon spokesman, "that Milosevic has the good sense to prefer negotiation." But with U.S. and NATO credibility on the line, hoping for good sense from the Serbs may be the ultimate Balkan folly. - with reporting by Mark Thompson/Washington

### Kosovo's Army in Waiting

N THE STEEP SLOPES OF CENTRAL KOSOVO, A MAGENTA KIA 4X4 SLOWS TO A crawl amid the cheers of running children. Behind the wheel, the rebel Albanian commander known as Celiku, or "Steely," acknowledges their play-soldier salutes, greets several wizened old men and continues up the mountain to his hilltop compound. Sitting on the cushioned floor of his house, sipping thick Turkish coffee, Celiku, a commander of the Kosovo Liberation Army's "general headquarters," says there's only one way to end the war in the secessionist southern Serbian province. "Serbia has to be defeated militarily." he says. "Otherwise they will not withdraw."

Eighteen months ago, the idea that the K.L.A. could be the agent for that kind of humiliating defeat would have been greeted with derision in Belgrade. No one's laughing now. In just over a year, the K.L.A. has transformed itself from a disorganized network of bandits into a presentable, if limited, guerrilla army. That army is a fraction of the size of the Yugoslav army, but it has all the classic guerrilla advantages: the loyalty of the population, an intimate knowledge of the terrain and a brutality that won its members the label of "terrorists" a year ago. Already they have killed hundreds of Serb security forces in ambushes and sniper attacks. By last week, as the Yugoslavs massed some 40,000 troops in and around Kosovo's borders, it may have looked like overkill in dealing with a small guerrilla force. But the K.L.A., funded by millions of dollars in

aid from sympathetic overseas Albanians-and perhaps millions more in smuggling revenues-has become a le-

repression has BATTLE PLAN: Robels and hit-and-run tactics against Serbs and

gitimate power in the Balkans. Much of that success comes from a diffuse, hydraheaded power structure that has rebounded from repeated attempts to put it down. The general headquarters, based in central Kosovo, consists of a dozen or so men who control the political, civil and military operations of the 3,000 to 10,000 rebels. In the field, however, commanders operate with independence. There is safety in that broad, nontraditional power base: it means there is no one head for the Serbs to cut off. It has produced a wide range of K.L.A. leaders, from bloodthirsty

terrorists who target civilians to patriots ready to die for their putative country. Some commanders are outright criminals. Interpol cops say parts of the K.L.A. are

funded by profits from smuggling along the infamous "Balkan route, the main line for 90% of Western

Europe's heroin.

Other commanders are more professional. Commander Remi, 28, who controls a region that includes the capital of Pristina, is a former law student. Operating from a bland house about 30 minutes north of Pristina, he has made a reputation for himself by holding off violent Serb attacks, although not without casualties. But after years of Serbian repression, there is no shortage of young men willing to die for independence. Says Mohamet Latifi, a soldier serving under Remi: "If someone attacked your house, would you run away or would you defend it?" -By Massimo Calabresi/Pristina

# Talking With a Queen

Jordan's Noor speaks about King Hussein's death and her future

By SCOTT MACLEOD AMMAN

ER WHITE LACE SCARF IS AN EMBLEM of the nation's sorrow. Day after day, as she received the thousands of Jordanians who came to pay their condelences, the yans, as it is called in Arabic, framed a spirit for which her husband was renowned: courage with an admixture of warmth and charm.

Normal Machine and the state of the state of

Yet with her favorite black-and-white photo of King Hussein framed in silver at her side, the story she tells of their last months and days together, especially "the sudden, vicious rebound [that] caught us all by surprise," is a heartbreaking final chapter to one of the Middle East's most unusual romances. Noor says the six months in the U.S. during Hussein's cancer treatment were among their most enriching times together since the former Princeton cheerleader (né Lisa Halaby) married the Arab monarch two decades ago. They lived at the Mayo Clinic in Minnesota, kept up on work in Jordan via e-mail, spun around in a Volkswagen Beetle, browsed in bookstores, walked in nearby woods and watched Canada geese settling down for autumn nights. "I never managed to get him out Rollerblading," says the Queen, whose Arabic name means "Light of Hussein." And then her voice breaks as she explains how "these moments meant much more to us than ever before, knowing that each one was God's gift."



When the royal couple returned to lordan in mid-January, they did not expect the King to die. Contrary to speculation, Noor says the 63-year-old monarch believed he was winning his battle against non-Hodgkin's lymphoma. His physicians believed as much when they sent him home. But a week after, the King began to grow weaker. He was working on a draft of a document that would rewrite Jordanian history-a letter replacing his 51-year-old brother Hassan as heir with his son Abdullah, 37. When doctors advised him to return to the U.S., Hussein quickly finished the letter, had it read on Jordanian television and flew to the Mayo Clinic.

and new outer study comes. The remained beyond that a fresh that the property of the comes of th

plunge into the emotional crowd of Jordanians keeping vigil outside despite a winter rainstorm. It was, she says, "to offer them some peace, and to ask them to pray for him."

Noor has been variously criticized for being an outsider, a jet-setter or a Western woman crusading in a conservative culture. Yet she is deeply rooted in Jordan, where her bearing through the King's illness and death won millions of hearts. She knows the torch has passed to her stepson King Abdullah and her own eldest son Crown Prince Hamzah, 18, who is studying at Sandhurst and bears a striking resemblance to his late father. Abdullah's wife Rania, 28, is expected to be named queen soon, but that shouldn't be a problem: Noor shared the title with Hussein's mother Oueen Zein until she died in 1994.

Indeed, all seems quiet on the palace-intrigue front. When asked what Hussein meant when the last message of his 47

years on the throne referred to "slandering and falsehoods" against Noor, she replies curtly, "I don't even want to talk about it." She was clearly maddened by rumors that she manipulated the change in succession

to gain power for her son. As Noor enumerates her projects, it is clear that she would like to continue the activist role she pioneered for Arab women. Now that she has been released from the constraints of being the wife of a reigning King, she may speak out more forcefully. Famous for angering Washington with her views supporting Palestinian rights and, at one time, urging negotiation with Saddam Hussein, she is now tempted, it seems, to enter areas of advocacy that are politically taboo in the Arab world, such as democracy and human rights. Most dear to her is the new King Hussein Foundation, which seeks to promote debate and will perhaps offer a humanitarian prize. The work, in a way, would be an extension of Hussein's drive to modernize the Arab world. Noor says she doesn't feel it's a mission she'll face alone. "On a spiritual level," she explains, "I feel we are still

making the journey together."

For every expression there's a Toyota. TOYOTA everyday

### **Nuclear Winter**

Russian Prime Minister Primakov's visit this week highlights a growing chill with the U.S.

By J.F.O. MCALLISTER

ACK WHEN BILL AND BORIS WERE new in their jobs, they called each other friend and partner, and Washington placed its chips on a bet that Russia could be Poland-able to shed Marxism in short order for free markets, democracy and cooperation with the West. This week, when Russian Prime Minister Yevgeni Primakov arrives on his first official trip to Washington, the wreckage of that early optimism will be piled high. Yeltsin is sick, erratic and unpopular. Parliamentary elections scheduled for December are likely to give more power to communists and nationalists. The ruble's collapse last summer, Moscow's struggles with its foreign debt and vast corruption have terrified investors and left average Russians convinced that capitalism is a con game fixed by criminals in high places. The government can't collect enough taxes to keep afloat, and has delayed economic reforms to preserve stability. Meanwhile, life is so miserable that life expectancy for men has dropped to 58 (from 65 years in the mid-'80s) and the country's population shrank by 400,000 last year. "Russia," says Paul Goble, a Radio Free Europe analyst, "has more in common with Somalia than Poland.

No one in the Clinton Administration goes that far. But Russia's problems seem so so goes that far. But Russia's problems seem so vast and impervious to foreign help that the forevard momentum has drained out of its Tschor Falbott, its chief architect, now advises "strategic patience." Republicans, enhused by polls that show growing discomfort with Clinton's leadership in foreign affairs, are hoping to draw blood from the Administration's evident lack of a Russia policy. An added incentive Al Core will be beginned to the property of the

the Administration's point man in talks with Primakov.

The main plan for U.S. aid to Bussia is frighteningly modest in the eyes of Bussia worriers—some extra dollars for a program to keep Bussian nuclear technology and scientists from ending up in dangerous places. There is no plan for a policy to help Bussia through its chaos and bring out a friendly government on the other side. "We'd love to help them do more," says an Administration official." but I Friendly object the plan of the pla

But Primakov arrives in Washington with a full "to do" ist. His biggest hope is for a multibillion-dollar loan from the International Monetary Fund. So far the 1MF insists that new loans will be contingent on fiscal responsibility in Moscow. Faced with a choice between lending and chaos, however, the 1MF may well cut a check.

To improve his chances, Primakov has been plucking weeds from the U.S.-Russia agenda. Last week he took steps to have the Duma ratify the long-delayed START II treaty. which will slash U.S. and Russian nuclear arsenals by two-thirds. And his Nuclear Energy Minister hinted that the country might curtail some of the atomic work with Iran that prompted U.S. sanctions. The two nations have some clearly irreconcilable differences-Iraq and Kosovo, in particular. At home millions of Russians are souring on the U.S. A U.S. Information Agency poll found that 75% of Russians believe the U.S.

is "using Russia's current wealcness to reduce it to a second-rate power." The domestic backlash may mean the U.S. is on the brink of losing its once close relationship with the Russian leadership.

Ironically, Washington's biggest problem right now may be Yeltsin himself. Despite public denials, Primakov seems to want Yeltsin's job—an ambition that has resulted in a quick pink slip for previous Prime Ministers. And

while American policymakers may find it frustrating to deal with Primakov, they are terrified of the alternatives. With reporting by



## WHAT THE

Primakov, a former Russiar spymaster, has never been a Washington favorite. But Russia is in such bad shapi that the main goal for both sides is to prop up his still fragile government Russia needs cash to help restore stability. But an unrealistic budget is making the IMF wary

2. BALKANS
Primakov is sic of U.S. threats to bomb the Serbs. Hopes his complaining can pix air strikes

3. NUKE BOOST
The U.S. wants
Russia to stop
passing nuclear tech to
Iran. Primakov wants
cash in exchange

4. START II
Clinton wants
this arms treaty
ack on line. Primakov
ays maybe—it's his
nly real leverage



#### INTRODUCING DELL'S NEW PENTIUM' III PROCESSOR-BASED DESKTOP.



With the new Intel® Pentium® III processor at 500MHz, our new Dell' Dimension' XPS T500 represents a new generation of 3D technology. This system is designed to handle the next wave of power-hungry applications and peripherals. like hyper-realistic gaming and digital cameras. Go online at www.dell.com/nextdimension to take an interactive tour of our newest Dimension. And see what life can be like when you get a piece of tomorrow, today

#### **NEW DELL® DIMENSION® XPS T450** PENTIUM® III PROCESSOR AT 4500

. 96MR 100MHz SDRAM

- . 12.9GB4 Ultra ATA Hard Drive
- . 17" (16 ft\* vis 26do) M780 Monitor
- BMB ATI XPERT 98D 3D AGP Graphics Card
- . 40X Max: Variable CD-ROM Drive
- · Yamaha XG 64V Wavetable Sound
- · harman/kardon HK 195 Speakers . 3Com\* USR V90 PCI Telephony WinModern w
  - Trial Offer ConnectDirect "Internet Access"
- . MS Works Suite 99 with Money 99 Basic, McAfee VirusScan
- . MS Windows\* 98/MS IntelliMouse\* . Dell QuietKey\* Keyboard
- · NEW Power Game Pack
- · 3-Year Limited Warranty
- . 1-Year At-home: Service
- \* Upgrade to ACS 295 Speakers with Subwouler

\$68 Min 36 Mas E+VALUE CODE: 78129-500317a

#### **NEW DELL DIMENSION XPS T500** PENTIUM III PROCESSOR AT 50

. 12.9GB1 Ultra ATA Hard Drive

- . 17" (16.0" vvs. 26dp) Trinitron\* 1000HS Monitor
- . 8MB ATI XPERT 98D 3D AGP Graphics Caril
- . 4.8X Max" Variable DVD RDM Drive
- Turtle Beach Montesqu A3D 64V Sound · ACS 295 Speakers with Supwinder
- · 3Com USB v 90 PCI feliations WinMuden with Inal Offer SunnertBreut internet Access
- Tomega 100MB ZIP BUILT-IN Drive with One Disk . MS Works Suite 99 with Money 99 Basic, McAtee VinusScan
- . MS Windows 98/Logitech MouseMan Wheel
- Dell QuietKey Keyboard · NEW Power Game Pack
- · 3-Year Limited Warranty
- · 1 Year At name | Service \* App an APC SurgeStation Pro 812 for \$39

SHUMS TO MAKE E+VALUE CODE: 78129-500322c



TO ORDER TOLL-FREE

800-953-7607





Are you Y2K DK? www dell.com/v2k

Phone Hours: M-F 7a-11p • Sat-Sun 8a-8p CT • In Canada; call 800-839-0148 • In Mexico; call 001-800-210-7607

\*Personal leasing arranged by Dell Financial Services L.P., an independent entity, to qualified customers. Amount of monthly lease payments above based on 35-month lease. All above monthly lease payments exclude taxes which may vary (for example, Hartford City, asked tax % 34-34 (Month). Shipping cost due with first payment. No security deposit required: subject to credit approval and availability. Lease rms subject to change without notice

pentium<sup>o</sup>//



By ADAM COHEN



community's heart. Ten-year-old Jeanine Nicarico, home from school with a cold, was taken from her suburban Chicago house in broad daylight, raped CRUZ at a recent and killed. Her badly press conference

IT WAS THE KIND OF

erime that breaks a

beaten body was discovered two days later in a wooded area six miles away. The public demanded that the murder be solved, and the police obliged. Du Page County residents slept a little better after police arrested Rolando Cruz, a

street tough from a nearby town. Local prosecutors finished the job, presenting a solid case that landed Cruz on Illinois'

The only trouble was that Cruz didn't kill Jeanine Nicarico. A sheriff's officer later admitted that he testified inaccurately about a key piece of evidence used at Cruz's trial, Cruz was freed in 1995, after 11 vears in iail. Another man-a convicted murderer and rapist whose earlier confession to the murder had been ignored-was linked to the crime by DNA. After an independent investigation, seven prosecutors and law-enforcement officials were indicted on charges of fabricating and suppressing evidence to frame Cruz

The trial of the Du Page Seven, as they

are known, is expected to start this week, and it could make history. If they are found guilty, the prosecutors in the group will be the first in the nation ever convicted of crimes for railroading an innocent man. The charges, which the defendants deny, have caused an uproar in Illinois. The state has freed two men from its death row this year after investigations support-

ed their innocence.

The Illinois cases of errant prosecution bring a new element to the growing national debate about overzealous law-enforcement agents, a furor stoked by high-profile police shootings in New York and California as well as "racial profiling" by New Jersey state troopers. The question is whether law enforcement, amid its extraordinary suc-





a death sentence That's where it was headed. Investigators began to suspect that the talkative Cruz was involved in the killing, but they had no solid evidence linking him to it. Then the socalled vision statement materialized Detectives say Cruz told them he had a vision of Nicarico's killing, including details only the killer could know. The statement was the most damning piece of evidence against Cruz when he was tried and convicted of the crime. Still, it was always a little fishy. Despite its importance, the detectives hadn't tape-recorded it or even taken notes about it. But a prosecutor, Thomas Knight, claimed that detectives had told him about the vision statement. Cruz was convicted and sentenced to death in 1985

While Cruz was on death row, another young girl was killed. The man who confessed to that murder, Brian Dugan, was the man who had admitted killing Nicarico. When Marshall and a team of prominent lawyers stepped in, they collected DNA evidence proving Cruz couldn't have committed the rape. They also hammered away at the vision statement. At Cruz's third trial. Lieutenant James Montesano testified that he was on vacation in Florida on the day his detectives claimed they had called him about Cruz's vision. The judge angrily dismissed the case and set Cruz free.

Under pressure to find out what went wrong, Du Page County appointed a special prosecutor, William Kunkle, who had made his name putting serial killer John Wayne Gacy on death row. Kunkle concluded that the vision statement was fabricated and that Cruz had been framed. He filed charges against three former Du Page prosecutors (two of them later became a sitting judge and an assistant U.S. Attorney) and four sheriff's deputies. The defendants all insist they are innocent, and the Nicarico family has rallied to their defense. The trial. likely to last more than a month, may be tough going for prosecutors. They will need to persuade a jury that a phalanx of law officers tried their best to send an innocent man to the electric chair. Such a thing should be unthinkable. Sadly, it is not

The Du Page Seven trial comes at a moment of extraordinary soul-searching for the Illinois justice system. Earlier this month Anthony Porter, who has an IQ of 51, was freed from death row after serving 16 years for a double murder he did not commit. At the time of his trial, Porter could not afford an investigator to work on his case, and his lawyer called a grand total of three defense witnesses. Porter was freed when a Northwestern University journalism class investigated his case and obtained a confession from another man. A key prosecution witness, who later recanted, now says police threatened him into testifying against Porter.

In another Illinois case this month, four men who served up to 18 years for a double murder they did not commit reached a \$36 million settlement with Cook County. In their suits, the so-called Ford Heights Four charged that the sheriff's office fabricated evidence and ignored or hid leads pointing to the four men who actually committed the crime. In the past dozen years, Illinois has freed 11 men from death rowone less than it has executed since 1977. Nine of the freed men were black or Latino.



BRIAN DUGAN had been ignored when he confessed to killing Jeanine Nicarico

The frame game some Illinois authorities have allegedly been playing hits the headlines at a time of heightened national concern over aggressive law-enforcement practices. In New York City, authorities have been on the defensive since last month, when a West African street peddler named Amadou Diallo was killed by police. He died in a barrage of 41 bullets as he entered his Bronx apartment building. The police say the officers fired on Diallo because they thought he was reaching for a gun. He was unarmed.

The Diallo killing has prompted a wave of protests and civil disobedience. More than 140 demonstrators, including Con-

cess in pushing the crime rate down, is showing too little regard for individual rights-especially those of blacks and Hispanics, who are most often targets of al-

ALLEGED FRAMERS

leged misconduct. "We cannot have the kind of country we want if people are afraid of those folks who are trying to protect them." President Clinton said during his press conference last Friday, after promising to seek \$40 million from Congress for improved police training and recruitment. Even supporters admit Cruz went look-

ing for trouble-and he found it. After the Nicarico slaying, police searched for leads in Aurora, the working-class town where Cruz lived. Perhaps prodded by a \$10,000 reward. Cruz began telling wild stories. The police took him on as an informant, settling gressman Charles Rangel, former Mayor David Dinkins and NAACE, president Kweisi Mfume, have been arrested in front of New York's police headquarters in the past two weeks. The protests are designed to pressure the police department—and especially Mayor Rudolph Giuliani—into advessing racism and brutality in the ranks. And New York City public advocate Mark Green last week called on Folice Commission of the Police Comm

The officers who shot Diallo were

officer to the No. 2 position in the streetcinese unit. (Black leaders dismiss the nove as window dressing.) Both Safir and Guilian have emphatically denied that the police are guilty of misconduct or racial last. The Diallo controverys, Guillania says, has been stirred up by political activists and the scandial-hungay press. In fact, he points out, fatal shootings by police are uttheir lowest level in 13 years. The police department is controversial, its supporters say, because it has been doing its job vigorously. And they note that it has been phenomenally effective. Robberies are

nity. Last week more than 1,200 people crowded into a Baptist church for a protest meeting led by the Rev. Jesse Jackson.

Complaints about law enforcement aren't confined to sensational police shootings. Day in and day out, minority communities around the country feel unfairly burdened by America's tough new policits strategies. In an illegal tactic called racial profiling, blacks and Latinos charge, New processing the complex of the proportionate erest police pull over a disproportionate control of the proportional control of the protoner of violation to charge them with. A study found that the troopers are five



members of the élite street-crimes unit. a plaintelothes force charged with getting guns of the street. The unit makes up 1% of the plaintelothes depart that the control of the plaintelothes of the plaintelothes of the plaintelothes of the control of the contro

A particular sore point is the unit's aggressive use of "stop and first" caticis. Of the 27,061 people its officers frisked last year, more than 80% were unarmed, which suggests that the cops felt they needed little in the way of probable cause to stop someone. Critics say the frisks are overly intrusive and unequally applied. "They will shake you down because of the other of your shin or the way you dress." On the property of the property of the property of NAPAD LEGICS.

Last Friday, Safir appointed a black

down 50% in the past four years, and murders are down 69%. The read danger, some New Yorkers say, is that the criticism will cause the crime rate to rise once again. "We need to be careful," says former New York City Police Commissioner William Bratton. "We don't want to oversensationalize it so the cops play turtle and decide not to get involved."

In California, Riverside remains torn by the shooting of Tyisha Miller last December. Miller, 19, a black woman, was waiting in a car with a flat tire for a cousin to bring help. When the cousin arrived, Miller seemed to be unconscious in the locked car with a gun on her lap. The cousin, fearing Miller was sick, called 911, and when the police arrived, they yelled at her to open the door and smashed a car window. Suddenly they fired 24 bullets into the car, striking Miller at least 12 times and killing her. Miller's family accuses the police of murder. But police say Miller was reaching for the gun despite their orders not to. The explanation hasn't satisfied many people in Riverside's black commu-

times as likely to target blacks as they are whites. Governor Christine Todd Whitman fired the state-police superintendent this month for defending his officers by saying minorities are more involved than whites in drug trafficking.

When crime rates are high-or when there is a horrific crime, like the Nicarico murder-the pressure on law enforcement is immense. But get-tough policies can mean getting tough on innocent people-even sending them to death row. With crime rates falling. Americans don't want to go soft on crime, but their sense of fairness is being sorely tested. Communities are beginning to ask how prosecutors and police can be effective while still respecting citizens' rights. Now it's time for law-enforcement officials to start taking the question seriously too. "The criminal-justice system works," says Jed Stone, who represented Rolando Cruz in an early trial, "only if the ordinary citizen believes in the integrity of the system." - Reported by Julie Grace/Chicago, Corliss M. Duncan/Los Angeles, Dion Nissenbaum/ Riverside and Elaine Rivera/New York

restless, the men and women who were

most frustrated with President Bush's do-

nothing approach to domestic policy. In the

Bush White House, they were known as the

Underground, the muscular and instinctive

politicians who were more libertarian and

diverse than the milkmen on whom the el-

der Bush relied. And they chafed during the

late 1980s and early 1990s as the Republi-

can Party alienated women and minorities

"This is the revenge of the deputies," says a

veteran Bush aide. "These are the idealists

say. Like them, he trusts his gut, takes risks and casts a wide net for advice. He'll need all

he can get, because when he finally breaks his policy silence, he'll have to make the case

for evicting a party that might as well

change its name to Dow 10,000. "This has been the cotton-candy decade," says Bush's

chief economic adviser, Larry Lindsey, taste-

testing a theme last week. "It's mostly spin,

all sweet and no sweat. Yes,

who wanted to do more. These people mirror Bush, his backers

### The Bush Rolodex

If George W. wants his campaign to look different from his dad's, why is he enlisting Dad's staff?

By MICHAEL DUFFY WASHINGTON



YOU'RE THE WILDLY POPULAR Governor of Texas, the alpha dog in the G.O.P.'s presidential Iditarod, running 15 points ahead of Al Gore in the polls. It all looks perfect, ex-BEHIND THE cept for those three small matters you can't do anything about: you look like your father, you sound like your father, and you're just one Herbert

shy of sharing the old man's four-part name. That name recognition isn't all bad-it helped make George Walker Bush the front runner-but he knows it won't take him where he wants to go. And so, at a time when he isn't saving much of anything else, George W. is working hard to signal that he's his own man. This is a neat trick in a family and country that value loyalty but worship winners. Which is why just about every time the Governor sits down with a group of pilgrims to Austin, he makes an important safe-

ty announcement, "This is not going to be George H.W. Bush, Part 2." he says, "It's going to be George W. Bush

Part L In fact, George W.'s Rolodex isn't that different from his dad's. It's getting hard to keep count of all the veterans of the old Bush Administration who are now house-hunting in west Austin. But what's most striking about the selection the Governor has made from his father's staff is how shrewdly he has chosen. In nearly every case, Bush has tapped the voung and the

CONDOLEEZZA Worked on Soviet affairs for President Bush; now she'll oversee foreign policy for his son



AL HUBBARD A Bush pal since busine school, the self-made Hubbard helped Bus nick his



people are happy, but ... we've let Social Security stagnate, Medicare fester and our national defenses deteriorate.

The G.O.P. has no ideological box big enough to hold the people Bush has gathered: conservatives of every stripe are pitching in. Lindsey, for example, may be a taxcutting supply sider, but he spent his time at the Federal Reserve fighting inner-city red lining by major banks. Al Hubbard, a onetime deputy chief of staff to Dan Quayle, pushed for massive deregulation of business during the 1990 recession and now squires kindred spirits to Austin. Fred Steeper, the Republican pollster with the best fingertip feel for independents, is likely to be back for his third George W. campaign, even though, Steeper says, Bush never had him take a poll during his first four years in office because, "he likes to do what he thinks is right.

On foreign affairs, Bush has turned to Stanford Provost Condoleezza Rice, a toughminded Russia scholar who worked for his dad. Her group mixes Reagan-era hard liners with Bush veterans Paul Wolfowitz and Robert Zoellick, who is regarded as suspect by conservatives because of his long association with the ever pragmatic James Baker.

Bush knows he must decide where he stands right now, because he will have no time to think once the campaign is rolling.

So he's holding what amounts to a monthslong policy seminar and keeping his notes to himself. The result is a Washington guessing game: Whom is he talking to? Whom is he "listening to"? And whom for substance, whom for show? About those things, Bush is right to be discreet. Conservatives growl when they hear he's talking to anyone remotely moderate.

The shell game can't last. If he runs, Bush will have to build bridges between bitterly divided camps. Ugly fights are inevitable, which means that by the time this race is over, father and son may have something else in

common: scar tissue.





# **Death at the Crossing**

A few hours outside Chicago, a fiery catastrophe ensues after a fabled train hits a flat-bed truck

By HOWARD CHUA-EOAN

N A LAMENT OVER THE DECLINE OF THE railways, Arlo Guthrie in 1972 sang of the train the City of New Orleans passing "trains that have no name" and "the graveyards of the rusted automobile" while onboard the "magic carpet made of steel" sat "mothers with their babes asleep ... rockin' to the gentle beat and the rhythm of the rails is all they feel," The City of New Orleans that left Chicago three minutes behind schedule last Monday night promised prouder vistas as it coursed along the Mississippi: historic Cairo, the blues from Beale Street in Memphis and, as finale, the Big Easy. Mothers continued to rock their babes to the rhythm of the rails, but the magic carpet had become more magical, the rail line revivified. Still, the song's lyrics were about to haunt the train. Especially this one: "All the towns and people seem to fade into a bad dream.

About eight miles north of a scheduled stop in Kankake, Ill., the 14-ear City of New Orleans rolled into its nightmane. Looking toward the railway crossing at the town of Bourbonnais, the engineer saw the warming lights flishing, the barriers down—and a truck carrying 20 tons of steel halfway across the tracks. There was no way to stop. The engine plowed into the railway to the control of the carriers of the ca

Just moments before, Sheena Dowe, 22.

had left her baby son Amause with a friend in the dining car and taken the friend's tod-dier to the toilet in the sleeper. When the crash rocked the trian, Dowe immediately pushed her friend's son out of the bathroom and screamed at him to run back to his mother. Then the door slammed shut, trapping her within. Meanwhile, as baggage flew and bodies turnbled, June Bonnia. Meanwhile, as baggage flew and bodies turnbled, June Bonnia. Abbar and the state of th



survivors within the Amtrak liner

curred and fuel from a punctured engine sparked a conflagration. All Bonnin had time to do was grab Ashley and hand her through the window to a cook from the dining car. Miniatures of horror emerged. Res-

cuers heard a young girl screaming and then abruptly stop, stilled by death. Meanwhile, another child was found in a ditch, calling for her mother, bleeding from the leg where she had lost a foot.

The driver of the truck was identified as John Stokes, Sq. ama with numerous traffic violations, including three speeding tickties received within a year. His license was supposed to have been suspended, but Stokes completed assiety class and won probation. Meanwhile, investigators were lookdedged the crossing gates to avoid waiting for the oncoming train. Stokes insists the lights at the crossing did not flash.

Of the 216 people onboard the City of New Orleans, some 120 were injured and 11 perished, including Dowe and Bonnin, For those two, the song's words "halfway home, we'll be there by mornin'" seem particularly heartbreaking. With Dowe died the excitement of a single mom eager to graduate from college in December. Her son turns two in May and cries for his mother. With Bonnin ended a stunning miracle: after six years of prayer and abjuring chemotherapy. she discovered three weeks ago that her non-Hodgkin's lymphoma was in remission. "After she'd come this far, it didn't seem right," says Bonnin's son Chris Tickle, 25. "But what I learned during the years she fought her illness. I'll keep with me forever." -With reporting by Jackson Baker/Memphis and Wendy Cole/Chicago

## Evidence Of Murder

A Yosemite mystery deepens after two bodies are discovered

By ROBERT F. HOWE

BY MOTHER, SIFTER AND FAMILY friend had been missing for a month by the time Cina Sund read her poem in frint of the thousand or so people who gathered in Modesto, Calif., March 14 to pray for the trib's asfer return. 'Deep in my heart 1 know something my mind does not want to laren, 'said Cina, Li, of Eureban when the control of the control of the control that's what you'd want your bally to be, but, Mormny, I don't want you to leave me."

Whatever hopes Gina may have harbored were cruched last week when authorities found the burned-out Pontiae Grand Prix that had been rented by Gina's mother Carole Sund, 42, for a holiday trip to Cosenite National Park with her daughter Julie, 15, and Silvina Pelosso, 16, a fried from Argentina. Opening the trunk principal Julie, 15, and Silvina Pelosso, 16, a fried the charred week, hidden 100 yie, off a remote pulpaway, law-enforcement officials discovered two hodies. By week's end, the vottime death released. There was some speculation that the blaze was so intense, a third body may have been completely incinerated.

Despite a thorough search, there was no sign of a third body or of suspects. Here was no sign of a third body or of suspects are noted, however, that only someone from the area would probably be familiar with the location where the car was found, off the narrow logging roads and at a spot deep in the woods, where locals often dump trash. We want resolution, and this brings us a step forward—this has been a fight, said Francis Carrington. Sund's father and head of Carrington Co., a Eurak-based head of Carrington Co., a Eurak-based

real estate firm. The family had offered more than \$300,000 reward for anyone with information connected to the disappearance.

Though the discovery answered vital questions in the case, authorities seemed no closer to determining exactly why or by whom the three



were abdueted. According to a reliable report, Sund and the girls were last seen Feb. 15, the day after they checked in to the Codar Lodge, a botel on Yosemite's western edge. Pelosos, the daughter of a friend Sund met in 1973, when she spent her high school senior year in Argentina, had joined the Sunda for a three-month vacation. The Sunds: had shown her Disneyland and the Bay Area, and no Phe. 12, Sund few to San Francisco with the girls and retried a curs on its proposition of the state of the sundary of th

The girls were reportedly eating dinner at the hotel the next night when Sund entered the restaurant, paid the bill quickly and ubsered the girls outside. Before leaving, the girls said they would return to finish their burgers, though they never did. The next day the three were scheduled to return to San Francisco, where they would meet Sund's habeland Jens, 63, and the form of Germanics of the second Jens, 63, and the form of Jens Sund, who has known Caroles since, plens Sund, who has known Caroles since, prington Co., did not find his wife at the San Triggton Co., did not find his wife at the San

Francisco airport and assumed she had flown ahead. She was not in Phoenix either. but he played a round of golf there the next day and, when she had still not even attempted to contact him, he called the police.

Authorities have named no suspects. But in connection with their investigation. they have questioned Billy Joe Strange, 39. a night ianitor at the Cedar Lodge restaurant who was arrested on March 5 for violating parole. Having twice been convicted of assaulting women, he is being held without bail in the Mariposa County jail. According to local newspaper reports, the FBI has searched Strange's home, impounded his borrowed van and seized his payroll records. A roommate. Darrell Stephens, 55, told the Fresno Bee, "The FBI has been harassing us for two weeks now ... The only reason they got [Strange] is because he was working there that night, and he was the only one working. It was just his bad luck. [Strange and I] didn't do any-thing; they're just fishing." Days after making these statements, Stephens, convicted in 1978 of rape and robbery, was jailed for

failing to register as a sex offender.

Even with clues from the burned car,

agents are unsure where they might next find answers. The landscape has sharp ravines, alpine lakes and mineshafts dating back to the gold-rush days of the mid-1800s. There are many places to hide evidence of a

crime. —With reporting by Michael Krantz Monsons and Elaine Marshall/Long Barn



Francis Carrington, Carole Sund's father, left; Raquel and Jose Pelosso at the news that the FBI had found the car their daughter had

# **Saving the Salmon**

best known around the world for Microsoft, Starbucks and rock bands like Nirvana, but residents know it for something less flashy: its nch stock of wild salmon, Last week the Federal Government noting that that stock is running dangerously low, placed seven types of salmon and two types of trout on its list of threatened or endangered species. Never before has the regulatory machinery of the Endangered Species Act been turned on so large or heavily populated an area. Saving the fish from extinction will require sacrifices from Seattle, Portland, Ore., and the surrounding counties and could slow development in one of the fastest-growing regions of the U.S. For now, locals-who face restrictions on everything from how they generate electricity to how they wash their cars-are rallying to the cause. reacting with none of the fury that greeted measures to protect the spotted owl in 1990. There are, to be sure, some dissenting voices, and when the new policies begin to bite, there are likely to be more. The only thing that seems certain so far is that saving the salmon will be an uphill fight. -By Jeffrey Kluss Reported by Todd Murphy/Portland and Dick Thompson/Washington

Ozette Lafe

#### LOCCING

Increased logging means increased erosion, causing topsoil to flow into rivers, smothering salmon eggs. Logging must be limited and

#### **GOLF COURSES**

Caring for greens requires lots of fertilizer and river water. Golf courses must recycle water and limit fertilizer.

#### HYDROELECTRIC DAMS Dams hurt baby fish by slow

down water, which raises its temperature and increases the time it takes the young to get to the ocean. Others are killed by the productive the productive through the productive throu

#### DMC

Cattle waste produces nitrogen runoff that poisons streams. Farmers must keep cows away from rivers, reduce cattle populations and treat waste befo using it as fertilizer.

TIME Graphic by Ed Gabel



SUBURBS

The Salmon Life Cycle: As salmon move through their cycle of birth, maturation, reproduction and death, they migrate through a variety of ecosystems where they are vulnerable almost every step of the way. The hatch in shallow streams, releasing larvae, or alevins (), which within a few months become juvenile fish called parr. Parr, in turn, grow into 8-in. smolts in about two years, and it is these small, silvery fish that make the improbable migration from freshwater river to saltwater ocean. Smolts that survive the trip-and plenty don't spend four years at sea, feeding and growing to full adult size (3 lbs. to 126 lbs.). Then they begin the long upstream journey () back to their hatching grounds, where they spawn and, a few weeks later, die. A small number of adults may survive this stage and, stubbomly, return to the ocean to repeat the cycle once more.

#### ers must wash cars less often

d limit pesticide and herbicide use, all which produce toxic runoff. Waterng toilets can help maintain river vners of riverfront homes must

#### CITY

toxins like motor oil into rivers. Inadequately treated sewage makes things worse. New sewage-treatment plants must be built and wetlands preserved to allow rainwater to filter

Water running off paved surfaces carries

ough soil.

#### What Else Is in Trouble?

In the past 12 months, the Fish and Wildlife Service issued 23 different rulings declaring 58 species of plants and animals endangered or threatened. The five most recently protected species are:

3/10/99: Sacramento splittali (threatened). 16-in. silvery-gold fish found in Suisun Bay, San Francisco Bay and elsewhere.

1/19/99: St. Andrew beach mouse (endangered). Measures 5 in., 2 in. of which is tail. Original habitat was Florida panhandle.

1/14/99: Topeka shiner (endangered). A type of minnow measuring about 3 in. long. Range

includes Kansas, Missouri, Iowa, South Dakota and Minnesota. 12/23/98: Arkansas River

shiner (threatened). Measures about 2 in, long, Found in New Mexico, Texas, Oklahoma, Kansa and Arkansas River basin. 12/3/98: Virginia sneezewe

(threatened), A 3.5-ft, vellowflowered plant used for making snuff, hence the name. Found in two counties in Virginia. Only 25 known populations left. In all, there are 1,180 species in

the U.S. protected by the Endangered Species Act. Of those, 924 are endangered (357 animals, 567 plants) and 256 are threatened (121 animals, 135 plants). Specifically, they include the following:

60 endangered, 8 threatened Birds

75 endangered, 15 threatened

14 endangered, 21 threatened Amphibians 9 endangered, 7 threatened

70 endangered, 40 threatened

61 endangered, 8 threatened

Snails 18 endangered, 10 threatened

Insects 28 endangered, 9 threatened

Arachnids 5 endangered, 0 threatened

Flowering Plants 539 endangered, 132 threatened

2 endangered, 1 threatened Furns and others 26 endangered, 2 threatened

# Sometimes you forget the milk. Sometimes you forget



Whether you are going to the store, to work or the dry cleaners, every trip you take in a Concorde LXi inevitably

The Chrysler Concorde was respectfully ranked "Best Premium Midsize Car in Initial Quality" by J.D. Power and Associates.

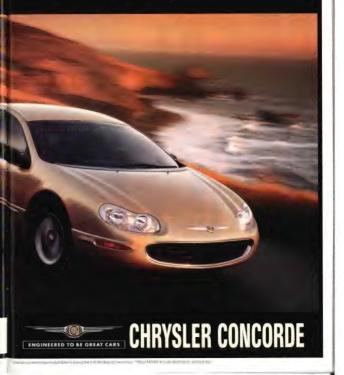
becomes a joyride. With every corner you become lost in the stability of its cab-forward architecture and low-speed traction control. As your thoughts begin to race, Chrysler Concorde LXi's smooth 4-speed automatic, a fully adaptive electronically controlled transaxle, actually begins to learn your driving style and tailors its internal shift patterns for you. Soon your fingers grip the leather-wrapped steering wheel and your mind hums along to the purring sounds of a 225 hp 24-valve V6. Now then, where are you going again? For more information about a test-drive you will never forget, call 1.800. CHRYSLER or visit www.chryslercars.com.



Featuring MacPherson struts up front and a multi-link configuration with Chapman struts at the rear, the exacting geometry



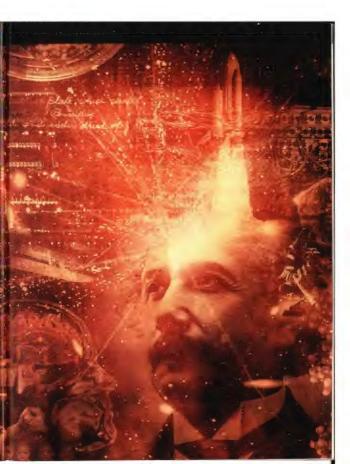
of the Chrysler Concorde's precisely tuned suspension reduces rear end squat under acceleration and front end dive under braking. Sometimes you forget the bread. the store altogether.



# THE **OF THE** CENTURY

This is the century that split the atom, probed the psyche, spliced genes and cloned a sheep. It invented plastic, radar and the silicon chip. It built airplanes, rockets, satellites, televisions, computers and atom bombs. It overthrew our inherited ideas about logic, language, learning, mathematics, economics and even space and time. And behind each of these great ideas, great discoveries and great inventions is, in most cases, one extraordinary human mind.





#### **PSYCHOANALYST**

# SIGMUND FREUD

He opened a window on the unconscious-where, he said, lust, rage and repression battle for supremacy—and changed the way we view ourselves

By PETER GAY

here are no neutrals in the Freud wars. Admiration, even downright adulation. on one side; skepticism, even downright disdain, on the other. This is not hyperbole. A psychoanalyst who is currently trying to enshrine Freud in the pantheon of cultural heroes must contend with a relentless critic who devotes his days to exposing Freud as a charlatan. But on one thing the contending parties agree: for good or ill, Sigmund Freud, more than any other explorer of the psyche, has shaped the mind of

the 20th century. The very fierceness and persistence of his detractors are a wry tribute to the

1900 Publishes The rpretation of Dreams

na to Lon 1939 Dies Sept. 23 in staving power of Freud's ideas. There is nothing new about such embittered con-

frontations; they have dogged Freud's footsteps since he developed the cluster of theories he would give the name of psychoanalysis. His fundamental idea-that all humans are endowed with an unconscious in which potent sexual and aggressive drives, and defenses against them, struggle for supremacy, as it were, behind a person's back-has struck many as a romantic, scientifically unprovable notion. His contention that the catalog of neurotic ailments to which

> humans are susceptible is nearly always the work of sexual maladjustments, and that erotic desire starts not in puberty but in infancy, seemed to the respectable nothing less than obscene. His dramatic evocation of a univer-

sal Oedipus FREUD WAS complex in USING which (to put HYPNOSIS a complicated TO TREAT PATIENTS issue too simply) HYSTERIAS the little boy loves his mother and hates his

ary conceit than a thesis worthy of a scientifically minded psychologist. Freud first used the term psychoanalysis in 1896, when he was already 40. He had been driven by ambition from

MOST FAVORED IN HIS LARGE FAMILY, YOUNG SIGMUND, STANDING BEHIND HIS MOTHER, CENTER, WAS ALWAYS HER "GOLDEN SIGGIE

his earliest days and encouraged by his doting parents to think highly of himself. Born in 1856 to an impecunious Jewish family in the Moravian hamlet of Freiberg (now Pribor in the Czech Republic). he moved with the rest of a rapidly increasing brood to Vienna. He was his mother's firstborn, her "golden Siggie." In recognition of his bril liance, his parents privileged him over his siblings by giving him a room to himself, to study in peace. He did not disappoint them. After an impressive career in school, he matriculated in 1873 in the father, seems more like a liter-University of Vienna and drifted from one philosophical subject to another until he hit on medicine. His choice was less that of a dedicated healer than of an inquisitive

explorer determined to solve

some of nature's riddles.

As he pursued his medical researches, he came to the conclusion that the most intriguing mysteries lay concealed in the complex operations of the mind. By the early 1890s, he was specializing in "neurasthenics" (mainly severe hysterics); they taught him much, including the art of patient listening. At the same time he was beginning to write down his dreams. increasingly convinced that they might offer clues to the workings of the unconscious. a notion he borrowed from the Romantics. He saw himself as a scientist taking material both from his patients and from himself. through introspection. By the mid-1890s, he was launched on a full-blown self-analysis, an enterprise for which he had no guidelines and no predecessors.

66





#### **TODAY WE ALL SPEAK FREUD**

His ideas—or ideas that can be traced, sometimes circuitious back to him—have permeated the language

PENS ENYY Freud's famous theory—not favored by feminists—that women wish fley had what men are born with.

FREUDIAN SLIP A scenningly meaningless slip of the tongue that is really e-mail direct from the unconscious

unconscious Repressed feelings, desires, ideas and memories that are hidden fro

REPRESSION Involuntary blocking of an unsettling feeling or memory from conscious thought

NEDIPLY COMPLEX In classic freedian theory, children in neir phallic phase (ages) tirree to six) form an erobic structurement to the parent of the positive sex, and a concomitanted (occasionally murderous oil the parent of the same sex CASTRATION ANNET? A boy's micronoscious fear of loaing his succession fear of loaing his

penis, and his fantasy that girls have airnady lost theirs SUBLIMATION Unconscious shifting of an unacceptable drive (lust for your sister, say) into culturally acceptable behavior (lust for your friend's sister) TRANSFERIENCE Unconscious

shifting of feelings about one person (e.g., a parent) to another (e.g., your analyst) to The part of the mind from which primal needs and drives (e.g., lust, rage) emerge suremean The part of the mind where your parents' and

SUPERGO The part of the mind where your parents' and society's rules reside: the original guilt trip EGO The mind's mechanism for keeping in touch with reality, it

referees the wrestling match between id and superego PHALLIC SYMBOLS Almost anything can look like a penis, but sometimes, as Freud is supposed to have remarked, "a cigar is just a cigar."

PATIENTS TAKING DR. FREUD'S
"TALKING CURE" LAY ON THIS
COUCH AND FOLLOWED THEIR
THOUGHTS WHEREVER THEY LED

he book that made his reputation in the profession-although it sold poorly-was The Interpretation of Dreams (1900), an indefinable masterpiece-part dream analysis. part autobiography, part theory of the mind, part history of contemporary Vienna. The principle that underlay this work was that mental experiences and entities, like physical ones, are part of nature. This meant that Freud could admit no mere accidents in mental procedures. The most nonsensical notion, the most casual slip of the tongue, the most fantastic dream, must have a meaning and can be used to unriddle the often incomprehensible maneuvers we call thinking.

Although the second pillar of Freud's psychoanalytic structure, Three Essays on the Theory of Sexuality (1905), further alienated him from the mainstream of contemporary psychiatry, he soon found loyal recruits. They met weekly to hash out interesting case histories. converting themselves into the Vienna Psychoanalytic Society in 1908. Working on the frontiers of mental science, these often eccentric pioneers had their quarrels. The two best known "defectors" were Alfred Adler and Carl Jung. Adler, a Viennese physician and social ist, developed his own psychology, which stressed the aggression with which those people lacking in some quality they desire-say, manliness-express their discontent by acting out. "Inferiority complex," a much abused term, is Adlerian. Freud did not regret losing Adler, but Jung was something else Freud was aware that most of his acolytes were lews, and he did not want to turn psychoanalysis into a "Jewish science. Jung, a Swiss from a pious Protestant background, struck Freud as his logical successor, his "crown prince." The two men were close for several years, but Jung's ambition,

and his growing commitment

to religion and mysticism—most unwelcome to Freud, an aggressive atheist—finally drove them apart.

Freud was intent not merely on originating a sweeping theory of mental functioning and madfunctioning, He also wanted to develop the rules of psychoanalytic therapy and expand his picture of human nature to encompass not just the couch but the whole culture. As to the first, he created the largely silent listener who encourages the analysand to say whatever comes to mind. no matter how foolish, repetitive or outrageous, and who intervenes occasionally to interpret what the patient on the couch is struggling to say. While some adventurous early psychoanalysts thought they could quantify just what proportion of their analysands went away cured, improved or untouched by analytic therapy. such confident enumerations have more recently shown themselves untenable. The efficacy of analysis remains

If often he was wrong and, at times, absurd, to us he is no more a person now but a whole climate of opinion.

w.H. AUDEN, after Freud's death in 1939



a matter of controversy, though the possibility of mixing psychoanalysis and drug therapy is gaining support.

Freud's ventures into culture-history, anthropology, literature, art, sociology, the study of religion-have proved little less controversial, though they retain their fascination and plausibility and continue to enjoy a widespread reputation. As a loyal follower of 19th century positivists, Freud drew a sharp distinction between religious faith (which is not checkable or correctable) and scientific inquiry (which is both). For himself, this meant the denial of truth-value to any religion whatever, including

Judaism. As for politics, he left little doubt and said so plainly in his late-and still best known-essay, Civilization and Its Discontents (1930). noting that the human animal, with its insatiable needs, must always remain an enemy to organized society, which exists largely to tamp down sexual and aggressive desires. At best, civilized living is a compromise between wishes and repression-not a comfortable doctrine. It ensures that Freud, taken straight, will never become truly popular, even if today we all speak Freud.

Freud was 81, the Nazis took over Austria, and after some reluctance, he immigrated to England with his wife and his favorite daughter and colleague Anna "to die in freedom." He got his wish, dying not long after the Nazis unleashed World War II by invading Poland. Listening to an idealistic broadcaster proclaiming this to be the last war. Freud, his stoical humor intact, commented wryly, "Mu last war."

In mid-March 1938, when

Yale historian Peter Gay's 22 books include Freud: A Life for Our Times



FAMOUS ANALYST IN HER OWN RIGHT, SPECIALIZING IN CHILDREN

#### POST-FREUDIAN ANALYSIS

has sold

er psychologists continued the work that Freud began, though not always in ways that he would have approved



CARL JUNG A former disciple of Freud's, Jung shared his mentor's enthusiasm for dreams but not his obsession

with the sex drive. Jung said humans are endowed with a "collective unconscious" from which myths, fairy tales and other archetypes spring.

ALFRED KINSEY little abou sex and

less led the first large-scale empirical study of sexual behavior. The Kinsey reports shocked readers by documenting high rates of masturbation and extramarital and homosexual sex.

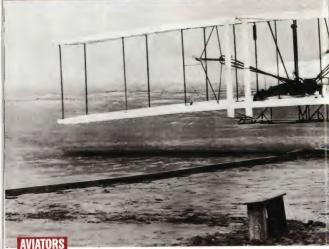
BENJAMIN SPOCK One of the first pediatricians to get psychoanalytic training, Dr. Spock formed commonsense principles of child rearing that shape the baby-boom generation Since 1946 his book or baby care

B.F. SKINNER A strict behaviorist who avoided all reference to internal mental states. Skinner believed that behavior can best be shaped through Contrary

tion, he did not raise his daughter in the "Skinner box" used to train pigeons.







A pair of self-taught engineers working in a bicycle shop, they made the world a forever smaller place

Orville Wright vere two brothers from the heartland of America with a vision as sweeping as the sky and a practicality as down-to-earth as the Wright Cycle Co., the bicycle business they founded in Dayton, Ohio, in 1892. But while there were countless bi-

ilbur and

cycle shops in turn-of-the-century America, in only one were wings being built as well as wheels. When the Wright brothers finally realized their vision of powered human flight in 1903, they made the world a forever smaller place. I've been to Kitty Hawk, N.C., and seen where the brothers imagined the future. and then literally flew across its high frontier. It was an inspiration to be there, and to

soak up the amazing perse-

verance and creativity of these two pioneers.

The Wright brothers had been fascinated by the idea of flight from an early age. In 1878 their father, a bishop in the Church of the United Brethren in Christ, gave them a flying toy made of cork and bamboo. It had a paper body and was pow-ered by rubber bands. The young boys soon broke the fragile toy, but the memory of its faltering flight across their living room stayed with them. By



# OTHERS

the mid-1806 Wilbur was reading every book and paper he could find on the still earthbound science of human flight. And four years before they made history at Kitty Hawk, the brothers built their first, scaleddown flying machine –a pilotlass "kite" with a 5-ft. wire and cloth. Based on that experiment. Wilbur became convinced that he could build an aircraft that would be "caper.

ble of sustaining a man."

While the brothers' bicycle business paid the bills, if was Wilbur's abiding dream of building a full-size flying machine that inspired their work. For many years, he once said, he had been "afflicted with the behief that flight is possible." The reality of that obsession was a lonely quest for the brothers in the workroom been ind their bike shop, plotting to

ORVILLE, LEFT, AND WILBUR: BICYCLE MECHANICS WHO HAD A VISION AS SWEEPING AS THE SKY



1867, Milville, Ind.; Orville: Aug. 19, 1871. Dayton, Ohio 1892 Open bike shop 1899-1902 Build and test kites and gliders 1903 Pilot first mannet powered flights of heavier-than-air craft 1906 Establish patents on airplane-control

system 1908 Contract to manufacture planes to U.S. Army 1912 Wilbur dies of

typhoid 1915 Orville sells interest in airplane factory 1948 Orville dies of heart attack

defy gravity and conquer the wind. Yet that obsessive kind of world-changing belief is a force that drives you to solve a problem, to find the breakthrough-a force that drives you to bet everything on a fragile wing or a new idea. It was a force that led the Wright brothers to invent, single-handedly, each of the technologies they needed to pursue their dream.

When published aeronautical data turned out to be unreliable, the Wright brothers built their own wind tunnel to test airfoils and measure empirically how to lift a flying machine into the sky. They were the first to discover that a long, narrow wing shape was the ideal architecture of flight. They figured out how to move the vehicle freely, not just across land, but up and down on a cushion of air. They built a forward elevator to control the pitch of their craft as it nosed up and down. They fashioned a pair of twin rudders in back to control its tendency to vaw from side to side. They devised a pulley system that warped the shape of the wings in midflight to turn the plane and to stop it from rolling laterally in air. Recognizing that a propeller isn't like a ship's screw, but becomes, in effect, a rotating wing, they used the data from their wind-tunnel experiments to design the first effective airplane props-a pair of 8-ft. propellers, carved out of laminated spruce, that turned in opposite directions to offset the twisting effect on the machine's structure. And when

IN FRANCE, HUGE CROWDS FLOCKED TO SEE WILBUR FLY THE NEW TWO-SEATER IN 1908

they discovered that a lightweight gas-powered engine did not exist, they decided to design and build their own. It produced 12 horsepower and weighed only 152 lbs.

The genius of Leonardo da Vinci imagined a flying machine, but it took the methodical application of science by these two American bicycle mechanics to create it. The unmanned gliders spawned by their first efforts flew erratically and were at the mercy of any strong gust of wind. But with help from their wind tunnel, the brothers amassed more data on wing design than anyone before them, compiling tables of computations that are still valid today. And with guidance from this scientific study, they developed the powered 1903 Fluer, a skeletal flying machine of spruce, ash and muslin, with a wingspan of 40 ft, and an unmanned weight of just over 600 lbs.

n Dee. 17, 1903,
with Orville at the
controls, the Flyer
lifted off shakily
from Kitty Hawk
and flew 120 ft.—
little more than
half the wingspan of a Boeing
747-440. That 12-see. flight
changed the world, lifting it
to new heights of freedom
and giving mankind access



#### **BEYOND KITTY HAWK**

Pioneering aircraft design did not end with the brothers Wright. Some of today's most innovative work is being done by designers in their own high-tech skunk works.

BURT BUTAM Airplane kits with nosemounted wings and no tall that seem to fly backward. Jets with oversize canards mounted, Wights-borders ably, florward that in 1986 was the lirst to fly around the world without reflexing. Aircraft designed by glurt Rutan don't look like other planes. One of the industry's most innovative and influential gondols for a round-the-world balloon attempt. a rigid winglike sall for an to places it had never before dreamed of reaching. Although the Wright brothers' feat was to transform life in the 20th century, the next day only four newspapers in the U.S. carried news of their achievementnews that was widely dismissed as exagerated.

The Wright brothers gave us a tool, but it was up to individuals and nations to put it to use, and use it we have. The airplane revolutionized both peace and war. It brought families together: once, when a child or other close relatives left the old country for America, family and friends mourned for someone they would never see again. Today, the grandchild of that immigrant can return again and again across a vast ocean in just half a turn of the clock. But the airplane also helped tear families apart, by making international warfare an

BY 1911, ORVILLE (BETWEEN CRACK-UPS) HAD SET A GLIDER RECORD OF NEARLY 10 MINUTES

The Wrights created one of the greatest cultural forces since the development of writing, for their invention effectively became the World Wide Web of that era, bringing people, languages, ideas and values together. It also ushered in an age of globalization, as the world's flight paths became the superhighways of an emerging international economy. Those superhighways of the sky not only revolutionized international business; they also opened up isolated economies, carried the cause of democracy around the world and broke down every kind of political barrier. And they set travelers on a path that would eventually lead bevond Earth's atmosphere.

The Wright brothers and their invention, then, sparked a revolution as far-reaching as the industrial and digital

Imagine a locomotive that has left its track, and is climbing up in the air ... without any wheels ... but with white wings instead ... and you will have something like what I saw.

an Ohio merchant, watching the Wrights in flight in 1904



revolutions. But that revolution did not come about by luck or accident. It was vision, quiet resolve and the application of scientific methodology that enabled Orville and Wilbur to carry the human race skyward. Their example reminds us that genius doesn't have a pedigree, and that you don't discover new worlds by plying safe, conventional waters, With 10 years of hindsight. even Orville Wright admitted that "I look with amazement upon our audacity in attempting flights with a new and untried machine.

Now, on the eve of another century, who knows where the next Wright brothers will be found, in what grade of school they're studying, or in what garage they're inventing the next Figer of the information age. Our mission is to make sure that wherever they are, they have the chance to

run their own course, to persevere and follow their own inspiration. We have to understand that engineering breakthroughs are not just mechanical or scientific-they are liberating forces that can continually improve people's lives. Who would have thought, as the 20th century opened, that one of its greatest contributions would come from two obscure, fresh-faced voung Americans who pursued the utmost bounds of human thought and gave us all, for the first time, the power literally to sail beyond the sunset.

The 20th century has been the American Century in large part because of great inventors such as the Wright brothers. May we follow their flight paths and blaze our own in the 21st century.

Bill Gates is the chairman and CEO of Microsoft

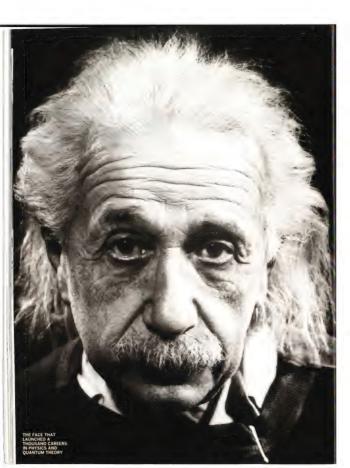
America's Cup winner, GM's Ultralight show car and the X-38 MAS crew-return wehicle. He is now testing his most exotic craft yet, the asymmetrical twin-engined Boomerang, designed to prevent instability should one engine fail. And he has set his sights on the \$10 million X-PRIZE for the first private spaceship to carry three passengers to sub-orbital attitude, land safely and return to space twice within two weeks.

PAUL MACCREADY in 1977 one of MacCready's creations, the Gossamer Condor, a kitelike affair powered only by a furiously pedaling cyclist-pilot, flew more than 7 min, Two years later, the Gossamer Albatross, an improved model, was pedaled

across the English Channel, In 1981 a pilot took the sun-powered Solar Challenger 163 miles from France to a base in England. No wonder the American Society of Mechanical Engineers in 1980 named MacCready its Engineer of the Century. In the years since, MacCready has fashioned such marvels as the wing-flapping pterodactyl that flew in the IMAX film On the Wing, the General Motors "Impact" electric car and the unmanned solar-powered Pathfinder, which has already flown to 80,000 ft.-higher than any other prope driven aircraft. -By Leon Jarofi



THE GOSSAMER ALBATROSS, DUBBED THE "FLYING BICYCLE," CROSSES THE ENGLISH CHANNEL IN 1979 WITH CYCLIST BRYAN ALLEN PROVIDING THE PEDAL POWER



#### PHYSICIST

# ALBERT EINSTEIN

The scientific touchstones of the modern age—the Bomb, space travel, electronics, quantum physics—all bear his imprint



By JAMES GLEICK

he name echoes
through the language: It doesn't take
an Einstein. A poor
man's Einstein. He's
no Einstein. In this
busy century, dominated like no other by sci-

nated like no other by science—and exalting, among the human virtues, braininess, IQ, the ideal of pure intelligence he stands alone as our emblem of intellectual power. We talk as though humanity could be divided into two groups. Albert Einstein and everybody else. He discovered, just by

thinking about it, the essential structure of the cosmos. The scientific touchstones of our age—the Bomb, space travel, electronics—all bear his fingerprints.

We may as well join him in 1905, when he was a patent-office clerk in Bern. Switzer-land—not the revered white-haloed icon of a thousand photographs, but a confident 26-year-old with wavy black hair and droll, wide eyes. That year, in his spare time, he produced three wond-shattering papers for a single volume journal Annalend of Physik. They were "blazing rockets which in the dark of the night."

He was almost wholly without sophistication ... There was always with him a wonderful purity at once childlike and profoundly stubborn.

J. ROBERT OPPENHEIMER, on Einstein

suddenly cast a brief but powerful illumination over an immense unknown region," as the physicist Louis de Broglie said. One offered the startling

One offered the startling view that light comes as much in particles as in waves—set-

BORN March 14, 1879, in Ulm, Germany 1902 Begins work at 5902 Begins work at 5902 Begins work at 5902 Begins work at 5903 Begins work at 5903 Begins work theory of relativity 1916 Proposes general theory of relativity; is 1916 Proposes general theory of relativity; is 1916 Proposes general theory of relativity; is 1918 Wins Nobel 1912 Wins Nobel 1912 Wins Nobel 1918 Primeton, N. B. 1918 Begins work 1918 Begins 1918 Begins work 1918 Begins work 1918 Begins 1918 Begins 19 ting the stage for generations of deep tension between granularity and smoothness in physicists' wew of energy and matter. Another discovered, imaginatively, the microscopic motion of molecules in a liquid—making it possible to calculate their exact size and incidentally proving their very reality (many scientists, as the century began, still doubted that atoms existed). And the third—well, as Einstein said in

a letter to a friend, it
"modifies the theory of
space and time." Ah, yes.
Relativity.

The time had come. The Newtonian world view was fraying at the edges. The 19th century had pressed its under-

> A POOR STUDENT AT 14. BY 26 HE HAD RESHAPED TIME AND SPACE

standing of space and time to the very limit. Everyone believed in the ether, that mysterious background substance of the whole universe through which light waves supposedly traveled, but where was the experimental evidence for it? Nowhere, as Einstein realized. He found it more productive to think in terms of utterly abstract frames of referencebecause these could move along with a moving observer. Meanwhile, a few imaginative people were already speaking of time in terms of a fourth dimension-H.G. Wells, for example, in his time-obsessed science fiction. Humanity was standing on a brink, ready to

see something new. It was Einstein who saw it. Space and time were not apples and oranges, he realized, but mates—joined, homologous, inseparable. "Henceforth space by itself and time by itself are doomed to fade away

into mere shadows," said Hermann Minkowski, a teacher of Einstein's and one of relativity's first champions, "and only a kind of union of the tow vill preserve an independent reality." Well, we all know that now. "Space-time." we knowingly call it. Likewise energy and matter: two faces of one creature. E = mc², as Einstein memorably announced.

All this was shocking and revolutionary and yet strangely attractive, to the public as well as to scientists. The speed of light; the shifting perspective of the observer-it was heady fare. A solar eclipse in 1919 gave English astronomer Arthur Eddington the opportunity to prove a key prediction of relativity: that starlight would swerve measurably as it passed through the heavy gravity of the sun, a dimple in the fabric of the universe Light has mass. Newspapers and popular magazines went wild. More than 100 books on relativity appeared within a year. Einstein claimed to be

the only person in his circle not trying to win a \$5,000 Scientific American prize for the best 3,000-word summary ("I don't believe I could do it").

The very name relativity fueled the ferror, for accidental and wholly unscientific reasons. In this new age, recovering from a horrible war, looking everywhere for originality and novelty and modernty, people could see that absolutism was no good. Everything had to be looked at Everything—for humanity's field of vision was expanding rapidly outward, to planets, stars, galaxies.

instein had conjured the whole business, it seemed. He did not invent the "thought experiment," but he raised it to high art imagine turins, oversing identical watches: one stays home, while the other rides in a spaceship near the speed of light. Little wonder



that from 1919. Einstein was and remains today—the world's most famous scientist.

In his native Germany he became a target for hatred. As a Jew, a liberal, a humanist, an internationalist, he attracted the enmity of nationalists and anti-Semites, abetted by a few jealous German physicists—an all too vigorous faction that Einstein called, while it was still possible to find this amusing. "the Antirelativity Theory Com-

#### SPECIAL RELATIVITY

### EINSTEIN'S THEORY OF RELATIVITY

elativity asserts that light always moves in a straight line through empty space, and always at the same speed in a vacuum, no matter what your vantage point. From these simple claims follow bizarre

consequences that challenge common sense and our perception of realitybut have been verified repeatedly by experiments.

TIME Graphics by Ed Gabel
Sources: World Book Encycloped
Einstein for Beginners



The observer watching the train thinks the light bulb and mirror are moving

The observer riding the train thinks the light bulb and mirror are standing still

### **Relativity and Time**

A moving clock runs slower than a stationary one from the perspective of a stationary observer

A man riding a moving train is timing a light beam that travels from ceiling to floor and back again. From his point of view, the light moves straight down and straight up.

Whatching from trackaide, Einstein sees the man, Jubi and mirrors a working sideways: the light traces a Einstein's vewpoint, the light travels farther. But since the speed of light is all wways the same, that when the side of light is all ways the same, that we have the same tracks and the same tracks are the same tracks ar



pany Ltd." His was now a powerful voice, widely heard. always attended to, especially after he moved to the U.S. He used it to promote Zionism. pacifism and, in his secret 1939 letter to Franklin D.

#### To punish me for my contempt for authority, Fate made me an authority myself.

on his rehalliousness

Roosevelt, the construction of a uranium bomb. Meanwhile, like any

demigod, he accreted bits of legend: that he flunked math in school (not true). That he opened a book and found an uncashed \$1,500 check he had left as a bookmark (maybe-he was absentminded about everyday affairs). That he was careless about socks, collars, slippers ... that he couldn't work out the correct change for the bus ... that he couldn't even remember his address: 112 Mercer Street in Princeton, N.L. where he finally settled, conferring an aura of scientific brilliance on the town, the university and the Institute for Advanced Study.

He died there in 1955. He had never accepted the strangest paradoxes of quantum mechanics (see box). He found "intolera ble," he said, the idea that subatomic particles would not obey the laws of cause and effect, or that the act of observing one particle could instantly determine the nature of AFTER AGE 37, WITH HIS BEST WORK BEHING another halfway across the universe. He had never achieved what he considered a complete, unified field theo-

ry. Indeed, for some vears he had watched the burgeoning of physics, its establishnent as the most powerful and expensive branch

of the sciences, from a slight remove. He had lived, he said. "in that solitude which is painful in youth but delicious in the years of maturity

And after the rest of Einstein had been cremated, his brain remained. soaking for decades in a jar of formaldehyde belonging to Dr.

Thomas Harvey, the Princeton Hospital pathologist. No one had bothered to dissect the brain of Freud, Stravinsky or Joyce.

GENERAL RELATIVITY



of motion, as seen by a stationary observer

observes a light beam that travels the length of the train car. Knowing the speed of light and the fravel time of the light beam he can calculate the length

of the train.



The observer on the train sees only the motion of the light beam

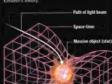
Because Einstein is not moving with the train, from his point of reference the rear of the train will be moving forward to meet the beam of light, making the light beam appear to be shorter. Because the speed of light is always the same, he will calculate the train's length to be shorter. Part of this effect is offset by the fact that his clock is moving faster, but part remains: the train actually shrinks. As the train approaches the speed of light, its length shrinks to nearly zero



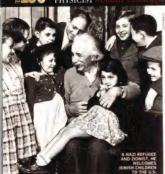
Someone watching from outside sees the light beam moving but with the motion of the train added

#### **Space-Time Distortion**

with the greatest distortions near the move objects. Because light travels in a stra rough the contours of space-time, a light



#### PHYSICIST



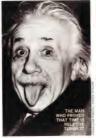
but in the 1980s, bits of Einsteinian gray matter were making the rounds of certain neurobiologists, who thus learned ... absolutely nothing. It was just a brain-the brain that dreamed a plastic fourth dimension, that banished the ether, that released the pins binding us to absolute space and time, that refused to believe God played dice, that finally declared it-

self "satisfied with the mystery of life's eternity and with a knowledge, a sense, of the marvelous structure of existence."

In embracing Einstein, our century took leave of a prior universe and an erstwhile God. The new versions were not so rigid and deterministic as the old Newtonian world. Einstein's God was no clockmaker. but he was the embodiment of reason in nature-"subtle but malicious he is not. This God did not control our actions or even sit in judgment on them. ("Einstein.

stop telling God what to do, Niels Bohr finally retorted.) This God seemed rather kindly and absentminded, as a matter of fact. Physics was freer, and we too are freer, in the Einstein universe. Which is where we live.

James Gleick is the author of Chaos. His next book, Faster, will be published in September



#### PLAYING DICE WITH THE UNIVERSE

among other things, that a beam of light is at once a fluttering wave of electromagnetism and a spray of bulletlike particles; that effects like radioactive decay occur without cause; that particles move from one point to another without traversing the space between; that the world is, at the smallest scales, grainy and discontinuous, like a roomful of dancers under a strobe; and that despite Einstein's dogged insistence that "God does not play dice," the most fundamental characteristic of the subatomic realm is its ultimate unpredictability. Yet quantum theory has proved indispensable in the invention of such applications as the laser, the atom bomb and the semiconductor, and in understanding the basic functioning of organic molecules, including DNA. The architects of this powerful yet counterintuitive theory were among the most brilliant minds of the century



desperation that led this German physicist to suggest that energy could be absorbed and emitted by matter only in tiny chunks not in a continu stream. These chunks, or "quanta," were the only way he could explain why heated objects glow with different colors of light depending on their temperatures. Like Einstein, though, Planck never accepted the revolution he helped foment; he believed that quanta were merely

MAY

DEANCE

It was "an



evidence of the way energy

itself was fundamentally

was processed, not that energy

Heisenberg came up with a technique for explaining and calculating the quantum behavior of particles ("matrix mechanics") that would later prove mathematically equivalent to Erwin Schrödinger's competing idea of "wave mechanics." He's best known, though, for his uncertainty principle. Because observing a tiny particle (by hitting it with light) disturbs it. the more accurately you know that particle's momentum, the less accurately you can kno its position, and vice versa. At its most fundamental level Heisenberg showed, nature will not be pinned down.



NIELS ROHE The first to quantum principles to the structure of the atom, Rohr

realized that electrons near a nucleus could occupy only certain positions and that they could change position only through "quantum leaps. moving from one place to another without seeming to traverse the space between. Bohr later became the leading proponent of the "Copenhagen interpretation" of quantum mechanics, which argues that bits of matter and energy are simultaneously particles and waves: it's the act of measurement that forces them to assume one form or another

**RICHARD FEYNMAN Perhaps** the greatest physicist of the mid-20th century, Feynman was, according to Freeman Dyson, "half genius and half buffoon." He retooled quantum mechanics, turning it into a practical mathematical tool. but he also played bongos, cracked safes and picked up women in bars. He wrote the brilliant Feynman Lectures on Physics, as well as the unabashedly selfpromoting Surely You're loking Mi Fevnman, When he went on TV to solve

the mystery of wi the Challenger blew up, his performance was part genius, part showmanship-and thus pure

@bull

171

ebear

www.schwab.com is an IBM e-business.

IBM scalable Web servers help Charles Schwab's customers trade over \$1 billion a day online.

IRM

CHEMIST LEO BAEKELAND

PLASTIC DICE, CIRCA 1945

Setting out to make an insulator, he invented the first true plastic and transformed the world

By IVAN AMATO

n the opening scene of The Graduate, Benjamin Braddock (played by a young Dustin Hoffman) is awkwardly working an affluent Southern Calisouthern Calison formia crowd at a graduation party arranged for him by his parents when a family friend offers one of the century's most famous pieces of cinematic advice: 1 just want to word; plasties: Millions of moviescers:

Millions of moviegoers winced and smiled. The scene neatly captured their own late-'60s ambivalence toward the ever more synthetic landscape of their times. They loved their cheap, easy-toclean Formica countertops, but envied-and longed for-the authentic touch and timelessness of marble and wood. The chord struck by that line in The Graduate underscored how much had happened in the six decades since the summer of 1907 when Leo Hendrik Baekeland made the laboratory breakthrough that would change the stuff our world is made of

A Belgian-born chemistentrepreneur, Baekeland had a knack for spotting profitable opportunities. He scored his first success in the 1890s with his invention of Velox, an improved photographic paper that freed photographers from having to use sullight for developing images. With Velox, they could rely on artificial light, which at the time usually mean realight but soon came to mean electric. It was a far more use to mean the could be used to the country of the country o

With that windfall, Baekeland, his wife Celine (known as "Bonbon") and two children moved to Snug Rock, a palatial estate north of

palatial estate north of Yonkers, N.Y., overlooking the Hudson River. There, in a barn he converted

BORN 1863 in

Ghent, Belgaum
1889 Sells rights to Velox
to George Eastman for
\$1 million
1904 Sets out to find a
synthetic substitute for
shellac
1907 Develops the first
all-artificial plastic, which
he calls Rakefile

1909 Introduces Baketite at a chemical conference and founds the General Baketite Corp. 1944 Dies in Beacon, N.Y. at 80

ALL-PLASTIC FAN.
1950

bellissimo

www.vespa.com is an IBM e-business.

When in Rome, visit your scooter dealer. When you're not, let IBM Web servers bring the showroom to you.

TRM

einto a lab, he began foraging for his next big hit. It wasn't long before the burgeoning electrical industry seemed to say just one word to him: insulators.

The initial tease for Baekeland-"Doc Baekeland" to many-WATCH, CIRCA was the rising cost of shellac. For centuries the resinous secretions that Laccifer lacca beetles deposited on trees had provided a cottage industry in southern Asia where peasants heated and filtered it to produce a varnish for coating and preserving wood products. Shellac also happened to be an effective electrical insulator. Early electrical workers used it as a coating to insulate coils, and molded it into stand-alone insulators by pressing together layers of shellac-impregnated paper.

When electrification began in earnest in the first years of the century, demand for shellac soon outstripped supply. Baekeland recognized a killer ap when he saw one. If only he could come up with a synthetic substitute for shellac.

thers nearly beat him to it. As early as 1872, German chemist Adolf von Baeyer was investigating the recalcitrant residue that gathered in the bottom of glassware that had been host to reactions between phenol (a turpentine-like solvent distilled from coal tar, which the gas-lighting industry produced in bulk) and formaldehyde (an embalming fluid distilled from wood alcohol). Von Baeyer set his sights on new synthetic dyes, however, not insulators. To him, the ugly, insoluble gunk in his glassware was a sign of a dead end.

To Backeland and others aiming to find commercial opportunities in the nascent electrical industry, that gunk was a signpost pointing toward something great. The challenge for

Baekeland and his rivals was to find some set of conditions-some slippery ratio of ingredients and heat and pressure-that would vield a more orkable, shellac-

like substance. Ideally it would be something that would dissolve in solvents to make insulating varnishes and yet be

as moldable as rubber

Starting around 1904. Baekeland and an assistant began their search. Three years later, after filling laboratory books with page after page of failed experiments, Baekeland finally developed a material that he dubbed in his notebooks "Bakelite." The key turned out to be his "bakelizer." a heavy iron vessel that

was part pressure cooker and



I just want to say one word to you. Just one word: plastics. There's a great future in plastics.

part basement boiler. With it,

he was able to control the formaldehyde-phenol reaction with more finesse than had anyone before him Initial heating of the phe-

nol and formaldehyde (in the presence of an acid or base to get the reaction going) produced a shellac-like liquid good for coating surfaces like a varnish. Further heating turned the liquid into a pasty, gummier goo. And when Baekeland put this stuff into the bakelizer. he was rewarded with a hard translucent, infinitely moldable substance. In a word: plastic.

He filed patent applications and soon began leaking word of his invention to other chemists. In 1909 Backeland unveiled the world's first fully synthetic plastic at a meeting of the New York chapter of the American Chemical Society. Would-be customers discovered it could be fashioned into molded insulation, valve parts,

pipe stems, billiard balls. knobs, buttons, knife handles and all manner of items.

It was 20th century alchemy. From something as vile as coal tar came a remarkably versatile substance. It wasn't the first plastic, however. Celluloid had been commercially available for decades as a substitute for tortoise-shell, horn, bone and other materials. But celluloid, which had developed a reputation as a cheap mimic of better traditional materials was derived from chemically treated cotton and other cellulose-containing vegetable matter. Bakelite was lab-made through and through. It was 100%

synthetic. Baekeland founded the General Bakelite Corp. to both make and license the manufacture of Bakelite. Competitors soon marketes BAKELITE CAMERA NO BIGGER THAN A MATCHBOX, 1934

MR. MCGUIRE, The Graduate

knockoffs-most notably Redmanol and Condensite, which Thomas Edison used in a failed attempt to dominate the nascent recording industry with "unbreakable" phonograph disks. The presence of inauthentic Bakelite out there led to an early 20th century



@chord >

www.yamaha.com is an IBM e-business.
Yamaha Global Jukebox Technology puts digital music on the Web. IBM technology puts it at your fingertips.

version of the "Intel Inside" logo. Items made with the real thing carried a "tag of genuineness" bearing the Bakelite name. Following drawn-out patent wars, Baekeland negotiated a merger with his rivals that put him at the helm of a veritable Bakelite empire.

akelite became so visible in so many places that the company advertised it as "the material of a thousand uses." It became the stuff of everything from cigar holders and rosary beads to radio housings, distributor caps and telephone casings. A 1924 TIME cover story on Baekeland reported that those familiar with Bakelite's potential "claim that in a few years it will be embodied in every mechanical facility of modern civilization."

In truth, Bakelite-whose more chemically formal name is polyoxybenzylmethylenglycolanhydride-was just a harbinger of the age of plastics Since Bakelite's heyday, researchers have churned out a polysyllabic catalog of plastics:

polymethylmethacrylate (Plexiglas), polyesters, polyethylene, polyvinyl chloride (PVC, a.k.a. vinyl), polyhexamethylene adipamide (the original nylon polymer), polytetraperfluo roethylene (Teflon), polyurethane, poly-this, poly-that.

In 1945, a year after Baekeland died, annual plastic computers (researchers are developing flexible transistors made of plastic instead of silicon so they can make marvels such as a flat-panel television screen that will roll like a seroll up your living-room wall). Plastic may not be as vilified now as it was in 1967, but it's still a stuff that people love

A man in middle years, erect, rugged ... with the sensitive mouth of a field marshal and the cold eves of a philanthropist.

cover story, Sept. 22, 1924

production in the U.S. reached more than 400,000 tons. In 1979, 12 years after The Graduate, the annual volume of plastic manufactured overtook that of steel, the symbol of the Industrial Revolution. Last year nearly 47 million tons of plastic were produced.

Today plastic is nearly everywhere, from the fillings in our teeth to the chips in our and hate. Every time a grocery clerk asks, "Paper or plastic?, the great debate between old and new, natural and synthetic. biodegradable and not. silently unfolds in a shopper's breast in the instant it takes to decide on the answer.

NPR science correspondent Ivan Amato is author of Stuff: The Materials the World Is Made Of

### 1902 First

artificial fiber, a 1909 Baekeland patents Bakelite 1915 Pyrex glass

1925 Cellophane 1926 PVC

1927 Scotch tape 1928 Safety

1929 Later foam rubber

1930 1932 Neoprene, the first

etic rubber 1934 Carothers invents

1935 Plexiglas

1938 Tellon 1940 Formica; massproduced nylon stockings 1942 Polyurethane foam: bubble wrap

1946 Nyton

1950 Silly Putty

1952 Mylar

1958 Lycra introduced

1963

965 Astroturf installed in Houston Astrodome 1975 Plastic soda bottles. 1976 Keylar bulletproof

1985 60-atom carbon, Buckyballs"), discovered



#### WALLACE HUME CAROTHERS: THE FATHER OF NYLON

HIS SYNTHETIC BUT NYLON SET OFF RIOTS IN THE STORES

ne would not be as kind to the century's other great plastics pioneer. Wallace Hume Carothers. A brilliant chemist but a troubled soul, Carothers was hired by DuPont in 1928 from his bastion at Harvard to run the company's newly minted Purity Hall. Executives in charge of DuPont's diversification from gunpowder into synthetics made a bet-unusual at the time-that an investment in "pure" science would pay off

They were right. Carothers was given a state-of-the-art lab, a bright young research staff and instructions to do basic research on polymers like Bakelite, cellulose and silk, whose molecular structure was a matter o intense debate. Carothers, applying the new ideas of quantum mechanics to some novel theories about the structure of polymers, correctly deduced that they were long chains of enormous numbers of small molecules chemically linked

Once he knew how natural polymers worked, making synthetic ones was relatively easy. Carothers'

first success was neoprene, a rubber like substance that DuPont started selling in 1932. His tour de force, however, was an artificial silk that Carothers called 66 polyamide but that DuPont dubbed nylon.

Nylon was an instant hit when it was introduced at the 1939 World's Fair DuPont promoted it with fervor using 30-ft.-long mannequin legs to show it off. Public demand for the stuff-especially nylon stockings-was overwhelming Women bought more than 4 million pairs in one day; newspapers reported "nylon riots" in the department stores. During World War II, when all DuPont's nylon production went into the war effort (for parachutes, tire cords, flak vests and rope), "a pair of nylon stockings could buy you anything," as one Navy researcher recalled

Carothers, however, saw none of this. A chronic depressive, he killed himself by drinking cyanide in a Philadelphia hotel room in 1937 two years before nylon hit the -By Iven Amate **@**unearth

www.nationalgeographic.com is an IBM e-business.



Unlike most Visa Cards, Discover Platinum offers low rates and a Cashback Bonus award on all your purchases. Mix those together and you get the color of money.

What do you get when you mix blue, white and gold? We don't know either, but it sure isn't a Cashback Bonus<sup>1</sup> award.



#### It pays to Discover. Platinum.

Call 1-800-DISCOVER and apply today or visit our Web site at www.discoverplatinum.com

#### PHILOSOPHER

# LUDWIG WITTGENSTEIN

He began by trying to reduce all mathematics to logic and ended by finding most metaphysics to be nonsense

By DANIEL DENNETT

f you would like to watch philosophers squirm-and who wouldn't?-pose this tough question: Suppose you may either a) solve a major philosophical problem so conclusively that there is nothing left to say (thanks to you, part of the field closes down forever, and you get a footnote in history); or b) write a book of such tantalizing perplexity and controversy that it stays on the required-reading list for centuries to come. Which would you choose? Many philosophers will reluctantly admit that they would go for option b). If they had to choose, they would rather be read than right. The Austrian philosopher Ludwig

go for a) and ended up with b). The revolution in mathematical logic early in the 20th century opened up a delicious prospect: a rigorous science of meanings. Just as the atomic theory in physics had begun to break matter down into its constituent parts and show how they fit together to produce all the effects in nature. bridge to become the protégé of Bertrand Russell, whose monumental Principia Mathematica (1913), written with Affred North Whitehead, was an asttempt to reduce all mathematics to logic. Wittgenstein's first book, published in England in 1922, the even more grandly titled Tractatus Logicophilosophicus, went even fur-

constituent parts and show how they fit together to produce all the effects in nature.

Philosophers are often like small children who scribble random marks on paper and then ask an adult. 'What is this?'

WITTGENSTEIN, who deliberately posed for a photo in front of this wall

BORN April 26, 1889, in Vienna 1912 Maves to Cambridge to study with Russell 1918 Completes the Tractatus during active service in World War I 1920 Works first as a schoolteacher, then as a gardener

Wittgenstein tried brilliantly to

frootleacher, then as gardener 29 Returns to imbridge as a cturer and gins work on intosophical restigations 51 Dies in logic held out the promise of accounting for all meaningful texts and utternances—from philosophy and geometrical proofs to history and legislation—by breaking them into their logical atoms and showing how those parts fit together (in an ideal language) to compose all the meanings there could be. As a young engi-

neering student in England, Wittgenstein saw the hope of the new mathematical logic, and rushed to Cam-PORTRAIT OF THE ther, and was thought by him, and by some of his admirers, to have brought philosophy to an end, its key problems definitively solved once and for all. Some "philosophical" propositions could be readily expressed and evaluated within his system, and those that couldn't—among them, metaphysical riddles that had bedeviled philosophers for centuries—www.engress.

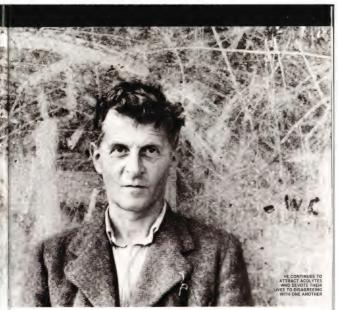
Wittgenstein returned to Austria to become a schoolteacher. But the worm of doubt soon gnawed, and he returned to England in 1929 to declare dramatically that he had got it all wrong the first time. The "later Wittganstein" spent the next 18 years agonizing, in front of a small Cambridge seminar of devoted and transitized students, who pood curious questions that he then answeredor pointedly did not fully autered of them engineering the properties of the company of the transitive of the provided his notes and left his second masterpiece, Philosophicial Investigations, for postthus call messing along, for post-

mous publication in 1953. Both books will be required reading

philosopher could claim to see.

as far into the future as any





The family into which Wittgenstein was born in 1889 was one of the wealthiest in Vienna, and young Ludwig grew up in a hothouse atmosphere of high culture and privilege Brahms and Mahler were frequent visitors to the palatial family home, and Ludwig's brother Paul, a concert pianist who lost an arm in World War I. commissioned works for the left hand by Richard Strauss, Ravel and Prokofiev. It was during the war that Ludwig, a volunteer in the Austrian artillery, completed the Tractatus shortly before he was captured and taken prisoner. Always an ascetic, he gave away his inheritance, relying on the generosity of his Cambridge champions, Russell and John Maynard Keynes, to secure academic employment for him, living frugally and in later life being cared for by his discribles.

You know from the moment you open the Tractalus that it is something specials. Each left-hand page is in German, facing its English translation on the right, and the sentences are numbered, using a hierarchical system that tells you this is a formal proof. The book begins straightforwardly enough: 1. The world is everything that is the ease.

(In German, it makes a memorable rhyming couplet: Die Welt ist alles, was der Fall ist.) And it ends with an ending to end all endings: "7. Whereof one cannot speak, thereof one must be silent."

In between, there is some tough sledding. Wittgenstein draws a distinction between what can be said, using words, and what can only be shown, and this raises the inevitable question: Does the *Tractatus*, as a text, say things that can't be said? Maybe. The next-to-last proposition is a famous shocker: "5.54. My propositions are elucidatory in this way; he who

understands me finally recognizes them as senseless, when he has climbed out through them, on them, over them. (He must so to speak throw away the ladder, after he has climbed up on it.) He must surmount these propositions; then he sees the world rightly."

Did this mean that the wonderful dream of logical atomism—a science of meanings—was hopeless? Or that there was much less to be said than one might have thought? Or what?

When Wittgenstein returned to philosophy in 1929, it was with the message that the



rigorous methods of pure logic could get no grip on the problems of philosophy: "We have got on to slippery ice where there is no friction and so in a certain sense the conditions are ideal, but also, just because of

I asked him to admit that there was not a rhinoceros in the room, but he wouldn't.

RUSSELL, on Wittgenstein's refusal to believe his own eyes

that, we are unable to walk. We want to walk: So we need friction. Back to the rough ground? Where being he had been a be

guage," he declared, and language bewitches us by enticing us to concoet "theories" to solve philosophical problems that arise only "when language goes on holiday."

Wittgenstein set out in particular to subvert the seductive theories about mind and consciousness that philosophers since Descartes had puzzled and battled over. Again and again in Philosophical Investigations, he catches his interlocutors in the act of being suckered by their overconfident intuitions about what their words mean-what their words must mean, they think-when they talk about what's going on in their own minds. As he says, "The decisive moment in the conjuring trick has been made, and it was the very one that we thought quite innocent." (Today's neuroscientists fall into these same traps with stunning regularity, now that they have begun trying to think seriously about consciousness. Unfortunately, Wittgenstein's work has not been appreciated by many scientists.) But didn't his own antidote to such theories constitute a theory of the mind? That is just one of many quandaries and paradoxes he has left behind for posterity.

In 1939, Wittgenstein's Cambridge seminar on the foundations of mathematics included a brilliant young mathematician, Alan Turing, who was giving his own course that term

WHILE ON LEAVE FROM THE ARMY IN 1918, WITTGENSTEIN, RIGHT, VISITED HIS FAMILY, ONE OF THE WEALTHIEST IN VIENNA

on the same topic. Turing too had been excited by the promise of mathematical logic and, like Wittgenstein, had come to see that it had limitations. But in the course of Turing's formal proof that the dream of turning all mathematies into logic was strictly impossible, he had invented a purely conceptual device-now known as a Universal Turing Machine-that provided the logical basis for the digital computer. And whereas Wittgenstein's dream of a universal ideal language for expressing all meanings had been shattered. Turing's device actually achieved a somewhat different sort of universality: it could compute all computable mathematical functions.

appily, in those days before tape recorders, some of Wittgenstein's disciples took verbatim notes, so we can catch a rare glimpse of two great minds addressing a central problem from opposite points of view: the problem of contradiction in a formal system. For Turing, the problem is a practical one: if you design a bridge using a system that contains a contradiction, "the bridge may fall down." For Wittgenstein, the problem was about the social context in which human beings can be said to "follow the rules of a mathematical system. What Turing saw, and Wittgenstein did not, was the importance of the fact that a computer doesn't need to understand rules to follow them. Who "won"? Turing comes off as somewhat flatfooted and naive, but he left us the computer, while Wittgenstein left us ... Wittgenstein

Some will say that in the longer run, Wittgenstein's legacy will prove to be the more valuable. Perhaps it will. Wittgenstein, like any other charismatic thinker, continues to attract fanatics who devote their life to disagreeing

with one another (and, presumably, with my brief summary) about the ultimate meaning of his words. These disciples cling myopically to their Wittgenstein, not realizing that there are many great Wittgensteins to choose from. My hero is the one who showed us new ways of being suspicious of our own convictions when confronting the mysteries of the mind. The fact remains that one's first exposure to either the Tractatus or Philosophical Investigations is a liberating and exhilarating experience. Here is a model of thinking so intense, so pure, so self-critical that even its mistakes are gifts.

Philosopher Daniel Dennett is the author of eight books, most recently Brainchildren: A Collection of Essays 1984-1996

#### BERTRAND RUSSELL

n more than 50 books penned over 74 years. Bertrand Russell set the terms of the debate in logic and philosophy in the first part of the century most notably with Principia Mathematica (1910-13). written with philosopher Affred North Whitehead

Airded North miteriesa.

He also married four times, lost three elections to Parliament, founded a school and led the movement for muelas twice jailed and dismissed from three jobs for his pacifism and unconventional views on sex. He won the Nobel Prize for Literature in 1950 and died two decades later at 97, a humane rationalist to the last. — By Unmash Kove



Biography

The people you thought you knew.

Escape the ordinary

#### **ELECTRICAL ENGINEER**

# PHILO FARNSWORTH

The key to the television picture tube came to him at 14, when he was still a farm boy, and he had a working device at 21. Yet he died in obscurity

#### By NEIL POSTMAN

or those inclined to think of our fading century as an era of the common man, let it be noted that the inventor of one of the century's greatest machines was a man called Phil. Even more, he was actually born in a log cabin, rode to high school on horseback and, without benefit of a university degree (indeed, at age 14), conceived the idea of electronic television-the moment of inspiration coming, according to legend, while he was tilling a potato field back and forth with a horse-drawn harrow and realized that an electron beam could scan images the

same way, line by line, just as you read a book. To cap it off,

he spent much of his adult life

in a struggle with one of

BORN Aug. 10 1500. In moles Ceva. Union. Tombos. Ceva. Union. Cova. Union. 2021 Has idea for how to create image suring electrons. 1927 Transmiss find. 1927 Transmiss find. 1927 Transmiss find. 1937 Transmiss find. 1938 Transmiss find. 1935 Transmiss find. 1935 Transmiss find. 1935 Transmiss find. 1936 Transmiss find. 1936

America's largest and most powerful corporations. Our kind of guy.

Irefer, of course, to Philo Taylor Farnsworth. The "of course" is meant as a joke, since almost no one outside the industry has ever heard of him. But we ought not to let the century expire without attempting to make amends.

Farnsworth was born in 1906 near Beaver City, Utah, a community settled by his grandfather (in 1856) under instructions from Brigham Young himself. When

Farnsworth was 12, his family moved to a ranch in Rigby, Idaho. which was four miles from the nearest high school, thus necessitating his daily horseback rides. Because he was intrigued with the electron and electricity, he persuaded his chemistry teacher, Justin Tolman, to give him special instruction and to allow him to audit a senior.

course. You could read about great scientists from now until the 22nd century and not find another instance where one of them celebrates a high school teacher. But Farnsworth did. crediting Tolman with providing inspiration and essential knowledge.

Tolman returned the compliment. Many years later, testifying at a patent interference case. Tolman said Farnsworth's explanation of the theory of retativity was the clearest and most concise he had ever heard. Remember, this would have been in 1921, and Farnsworth would have been all of 15. And Tolman was not the only one who recognized the young student's genius. With only two wars of high

school behind him, and buttressed by an intense autodidacticism, Farnsworth gained admission to Brigham Young University.

The death of his father forced him to leave at the end of his second year, but, as it turned out, at no great intel-

FARNSWORTH HOLDS HIS
"TELEVISION TRANSMISSION
TUBE." A FORERUNNER OF THE
MODERN TV CAMERA, CIRCA 1939

lectual cost. There were, at the time, no more than a handful of men on the planet who could have understood Farnsworth's ideas for building an electronic-television system, and it's unlikely that any of them were at Brigham Young. One such man was Vladimir Zworykin, who had emigrated to the U.S. from Russia with a Ph.D. in electrical engineering. He went to work for Westinghouse with a dream of building an allelectronic television system. But he wasn't able to do so. Farnsworth was. But not at

He didn't do it until he was 21. By then, he had found investors, a few assistants and a loving wife ("Pem") who assisted him in his research. He moved to San Francisco and set up a laboratory in an empty loft. On Sept. 7, 1927, Farnsworth painted a square of glass black and scratched a straight line on the center. In another room, Pem's brother. Cliff Gardner, dropped the slide between the Image Dissector (the camera tube that Farnsworth had invented earlier that year) and a hot, bright, carbon arc lamp. Farnsworth, Pem and one of the investors, George Everson, watched the receiver. They saw the straight-line image and then, as Cliff turned the slide 90°, they saw it movewhich is to say they saw the first all-electronic television picture ever transmitted.

History should take note of Farnsworth's reaction. After all, we learn in school that Samuel Morse's first telegraph message





EARLY SETS LIKE THIS ONE HAD A BACKWARD PICTURE THAT HAD TO BE VIEWED IN A MIRROR

was "What hath God wrought? Edison spoke into his phonograph, "Mary had a little lamb." And Don Ameche-I mean, Alexander Graham Bellshouted for assistance: "Mr. Watson, come here. I need you!" What did Farnsworth exclaim? "There you are," said Phil, "electronic television. Later that evening, he wrote in his laboratory journal: "The received line picture was evident this time." Not very catchy for a climactic scene in a movie. Perhans we could use the telegram George Everson sent to another investor: "The

damned thing works!" At this point in the story. things turn ugly. Physics, engineering and scientific inspiration begin to recede in importance as lawyers take center stage. As it happens, Zworykin had made a patent application in 1923, and by 1933 had developed a camera tube he called an Iconoscope. It also happens that Zworvkin was by then connected with the Radio Corporation of America. whose chief. David Sarnoff, had no intention of paying royalties to Farnsworth for the right to manufacture television sets. "RCA doesn't pay royalties," he is alleged to have said. "we collect them.

And so there ensued a legal battle over who invented television. RCA's lawyers contended that Zworykin's 1923 patent had priority over any of Farnsworth's patents, inconceived the idea when he was a high school student, but also produced the original sketch of an electronic tube that Farnsworth had drawn for him at that time. The sketch was almost an exact replica of an Image Dissector.

n 1934 the U.S. Patent Office rendered its decision, awarding priority of invention to Farnsworth, RCA appealed and lost, but litigation about various matters continued for many vears until Sarnoff finally agreed to pay Farnsworth rovalties.

But he didn't have to for very long. During World War II, the government suspended sales of TV sets, and by the war's end, Farnsworth's key

house in Maine, suffering from depression, which was made worse by excessive drinking. He had a nervous breakdown, spent time in hospitals and had to submit to shock therapy. And in 1947, as if he were being punished for having invented television, his house in Maine burned to the ground.

One wishes it could be said that this was the final indignity Farnsworth had to suffer, but it was not. Ten years later, he appeared as a mystery guest on the television program What's My Line? Farnsworth was referred to as Dr. X and the panel had the task of discovering what he had done to merit his appearance on the show. One of the panelists asked Dr. X if he had invented some kind of a machine that might be painful

cluding the one for his Image patents were close to expiring. He was an American original, brilliant, idealistic, undaunted by obstacles.

DAVID MCCULLOUGH, on the PBS television show The American Experience Dissector. RCA's case was not When they did. RCA was quick to take charge of the production and sales of TV

strong, since it could produce no evidence that in 1923 Zworykin had produced an operable television transmitter, Moreover, Farnsworth's old teacher, Tolman, not only testified that Farnsworth had

sets, and in a vigorous publicrelations campaign, promoted both Zworvkin and Sarnoff as the fathers of television Farnsworth withdrew to a

when used. Farnsworth answered, "Yes. Sometimes it's most painful.

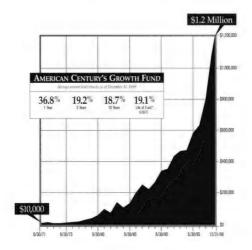
He was just being characteristically polite. His attitude toward the uses that had been made of his invention was more ferocious. His son Kent was once asked what that attitude was. He said. "I suppose you could say that he felt he had created kind of a monster, a way for people to waste a lot of their lives. He added, "Throughout my childhood his reaction to television was 'There's nothing on it worthwhile and we're not going to watch it in this household, and I don't want it in your intellectual diet.

So we may end Farnsworth's story by saying that he was not only the inventor of television but also one of its earliest and most perceptive critics.

Neil Postman is the Paulette Goddard Professor of Media Ecology at New York University



#### SMART ROTH CHOICE



#### Time Well Spent

Obviously, we can't assure you that American Century's Growth Fund will turn \$10,000 into a million dollars over the next 27 years. But we can assure you we'll continue the same, disciplined approach we used the *last* 27 years. Call American Century at 1-800-345-2021 to find out more about a growth fund that can make very good use of your time.

Please and, for a prospection with more complete information, including charges and exposes. Be sure to rest it carefully helper year interest. Naturally, and performance cost apparents taken results. These degrees, in the research, Sections and contrast and another coverrencessed. These issued a prospection for information about dise show doeses fragmented active could be used or these promption. If that the analytic degrees are described in the processor was present on sole-time states used on the size of the contrast found with any promption. If the size 104/15 is a gent framework or the period about controlled and function contrast produced in the contrast found with only proposed and processors of the PLT and Delethous time. To be Placement Contrast terrors Corporation.



AMERICAN CENTURY The average child will need \$80,000 for



Everyone thinks their child is above average. What if your child really is? What if he or she wants to become a Ph.D. in Chaos Theory, or study with a Nobel Prize winner at a world-famous university?

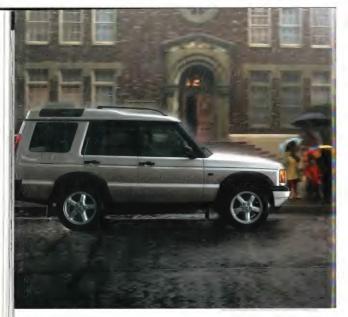
#### above average?

As you can imagine, these things don't come cheap.

So if your child is starting to score off the charts, even at an early age, it could be time for a visit with your State Farm agent.

Your agent will help make sure that you'll begin the 21st Century with a strong life insurance plan in place. Strong enough to launch a college career just as far as it can possibly go.





#### The new Land Rover now gets continuous weather reports. From its wheels.

Introducing the most technologically advanced Land Rover ever.

Whether you're expecting rain, snow, sleet, or even sunshine, there's one thing the forecast always calls for The all-new Land Rover Discovery

Series II. It now comes with electronic brake force distribution. A feature that

is designed to balance front and rear braking for increased driver control

And with its permanent four-wheel drive and four-wheel electronic traction control, it makes the whole



idea of canceling school because of the weather seem completely unnecessary.

Altogether, it's been totally reengineered from top to bottom. It even has some 13,500 new parts. Not to mention another remarkable feature: a starting MSRP of \$34,775°.

So call 1-800-FINE 4WD or visit us at www.Best4x4.LandRover.com. Because there's no better way to ride out a storm.

# ROCKET SCIENTIST ROBERT GODDARD

He launched the space age with a 10-ft. rocket in a New England cabbage field

By JEFFREY KLUGER

obert Goddard was not a happy man when he read his copy of the New York Times on Jan 13, 1920.
For some time, he had feared he might be in for a pasting in the pricked up the paper that day, he was stunned.

Not long before,

Goddard, a physics

professor at Clark University in Worcester, Mass.. had published an arid little paper on an outrageous topic, rocket travel. Unlike most of his colleagues, Goddard believed rocketry was a viable technology, and his paper, primly titled "A Method of Reaching Extreme Altitudes," was designed to prove it. For the lay reader, there wasn't much in the writing to excite interest, but at the end, the buttoned-up professor unbuttoned a bit. If you used his technology to build a rocket big enough, he argued.

SIMPLY FIZZLED ON THE PAD

end, the buttoned-up professor unbuttoned a bit. If you used his technology to build a rocket big enough, he argued, and if you primed it with full MANY OF GODDARD'S ROCKETS, LIKE THIS CLUMEY 1927 MODEL.

that was powerful enough, you just might be able to reach the moon with it.

reach the moon with it.
Goddard meant his moon
musings to be innocent
cough, but when the Times
saw them, it pounced. As
anyone knew, the paper
explained with an editorial
eye roil, space travel was
impossible, since without
the paper
to be a space of the paper
to be a space
to be

Goddard seethed. It wasn't just that the editors got the science all wrong. It wasn't just that they didn't care for his work. It was that they had made him out a fool. Say what

BORN Oct. 5, 1882, in Worcester, Mass. 1908 Regims studying physics at Clark University 1915 Proves that rocket engines can produce thrust in a vacuum 1926 Launchess the first, liquid-fueled rocket to an 1926 Launchess working in Roswell, N.Mex. develops supersonic and multi-stage rockets and fin-guided steering

you will about a scientist's research, but take care when you defame the scientist. On that day. Goddard-who would ultimately be hailed as the father of modern rocketry-sank into a quartercentury sulk from which he never fully emerged. And from that sulk came some of the most incandescent

achievements of his age Born in 1882, Goddard was a rocket man before he was a man at all. From childhood, he had an instinctive feel for all things pyrotechnic: he was intrigued by the infernal powders that fuel firecrackers and sticks of TNT. Figure out how to manage that chemical violence, he knew, and you could do some ripping-good flying.

As a student and professor

space. Fill a missile with that kind of fuel, and you could retire black powder for good. For nearly 20 years, God-

dard's theories were just theories. When he'd build a rocket and carry it out to a field, it never flew anywhere at all. When he'd return to Clark fizzled missile in hand, he'd be greeted by a colleague asking, as was his habit, "Well, Robert, how goes your moongoing rocket?" When he steeled himself to publish his work, the Times made him wish he hadn't

Finally, all that changed On March 16, 1926, Goddard finished building a spindly, 10-ft. rocket he dubbed Nell loaded it into an open car and trundled it out to his aunt Effie's nearby farm. He set up the missile in a field, then

GODDARD, LEFT, MADE GREAT ADVANCES IN NEW MEXICO IN THE '30S

slammed into a frozen cabbage patch 184 ft. away. The entire flight lasted just 24 sec .- but that was 2½ sec. longer than any liquid-fueled rocket had ever managed to fly before. Goddard was thrilled with

his triumph but resolved to say little about it. If people thought him daft when he was merely designing rockets, who knew what they'd say when the things actually started to fly? When word nonetheless leaked out about the launch and inquiries poured into Clark, Goddard answered each with a pinched, "Work is in progress: there is nothing to report," When he finished each new round of research. he'd file it under a deliberately misleading title-"Formulae for Silvering Mirrors," for example-lest it fall into the

wrong hands But rockets are hard to hide, and as Goddard's Nells grew steadily bigger, the town of Worcester caught on. In 1929, an 11-ft, missile caused such a stir the police were

called. Where there are police there is inevitably the press, and next day the local paper ran the horse-laughing headline: MOON ROCKET MISSES TARGET BY 238,799% MILES. For Goddard, the East Coast was clearly becoming a cramped place to be. In 1930. with the promise of a \$100,000 grant from financier Harry Guggenheim, Goddard and his wife Esther headed west to Roswell, N.Mex., where the land was vast and the launch weather good, and where the locals, they were told, minded their business

In the open, roasted stretches of the Western scrub, the fiercely private Goddard thrived. Over the next nine years, his Nells grew from 12 ft. to 16 ft. to 18 ft... and their altitude climbed from 2.000 ft. to 7.500 ft. to 9,000 ft. He built a rocket that exceeded the speed of sound and another with fin-stabilized steering, and he filed dozens of patents for everything from gyroscopic guidance systems to multistage rockets.

By the late 1930s, however. Goddard grew troubled. He had noticed long before that of all the countries that showed an interest

in rocketry, Germany showed the most. Now and then, German engineers would contact Goddard with a technical question or two, and he would casually respond. But in 1939 the

BY 1932, GODDARD, SECOND FROM RIGHT, WAS BUILDING ROCKETS FITTED WITH GYROSCOPES. THREE YEARS LATER HE WENT SUPERSONIC

#### Why don't you ask your own Dr. Goddard? He knows better than any of us.

A CAPTURED V-2 SCIENTIST, asked

at Worcester Polytechnic Institute and later at Clark, Goddard tried to figure out just how. Fooling around with the arithmetic of propulsion, he calculated the energy-toweight ratio of various fuels Fooling around with airtight chambers, he found that a rocket could indeed fly in a vacuum, thanks to Newton's laws of action and reaction. Fooling around with basic chemistry, he learned, most important, that if he hoped to launch a missile very far, he could never do it with the poor black powder that had long been the stuff of rocketry. Instead he would need something with real propulsive oomph-a liquid like kerosene or liq uid hydrogen, mixed with liquid oxygen to allow combustion to take place in

the airless environment of

summoned an assistant who lit its fuse with a blowtorch attached to a long stick. For an instant the rocket did nothing at all, then suddenly it leaped from the ground and screamed into the sky at 60 m.p.h. Climbing to an altitude of 41 ft., it arced over, plummeted earthward and







#### Outdistancing ourselves.

To Bratza use fiste, outries and floroused for and come a world also against a production of the processing of the proce

Dilling Second Distance

down on the ruined city. Rebuffed by the Army Goddard spent World War II on sabbatical from rocketry, designing experimental airplane engines for the Navy. When the war ended, he quickly returned to his



GODDARD, LEFT, AND HIS BROTHER-IN-LAW SALVAGE A SMASHED ROCKET IN 1927

preferred work. As his first order of business, he hoped to get his hands on a captured V-2. From what he had heard. the missiles sounded disturbingly like his more peaceable Nells. Goddard's trusting exchanges with German scientists had given Berlin at least a glimpse into what he was designing. What's more, by 1945 he had filed more than 200 patents, all of which were available for inspection. When a captured German scientist was asked about the origin of the V-2, he was said to have

responded, "Why don't you ask your own Dr. Goddard? He knows better than any of us." When some V-2s finally made their way to the U.S. and Goddard had a chance to autopsy one, he instantly recognized his own handiwork. "Isn't this your rocket?" an assistant asked as they poked around its innards. "It seems to be," Goddard replied flatly.

oddard accepted

that, as it turned

out, was the last

paternity of his bastard V-2, and

rocket he fathered while alive. In 1945 he was found to have throat cancer, and before the year was out, he was dead. His technological spawn, however, did not stop. American scientists worked alongside émigré German scientists to incorporate Goddard's innovations into the V-2, turning the killer missile into the Redstone. which put the first Americans into space. The Redstone led directly to the Saturn moon rockets, and indirectly to virtually every other rocket the U.S. has ever flown

Though Goddard never saw a bit of it, credit would be given him, and-more important to a man who so disdained the press-amends would be made. After Apollo 11 lifted off en route to humanity's first moon landing, the New York Times took a bemused backward glance at a tart little editorial it had published 49 years before. "Further investigation and experimentation," said the paper in 1969, "have confirmed the findings of Isaac Newton in the 17th century, and it is now definitely established that a rocket can function in a vacuum as well as in an atmosphere. The Times regrets the error." The grim Professor Goddard might not have appreciated the humor, but he would almost certainly have accepted the apology

TIME senior writer leffrey Kluger is the co-author, along with Jim Lovell, of Apollo 13

#### A HUNDRED-YEAR COUNTDOWN

Goddard was not the first to conceive of liquid-fueled rockets. but he was the first to make one fly. The descendants of his invention put machines into space and humans on the moon

▶ 1903 Russia's Tsiolkovsky oublishes Exploring Space with Reactive Devices," the first great rocketry study



1920 Goddard publishes the first of only two rocketry papers be will ever write

1926-39 Goddard liquid-fueled rockets. eventually building models that climb past 9,000 ft, and break the speed of

**◀1944** Germany, inspired in part by homegrown rocketeer Hermani Oberth and in part by Goddard, launches the first V-2 rockets

1945 German rocketeers, led by Wernher von Braun are brought to America to design rockets for the U.S.



▲ 1957 The U.S.S.R. launches Sputnik 1, the first satellite 1958 The U.S. answers with the smaller Explorer 1



▲ 1961 The U.S.S.R.'s Yuri Gagarin becomes the first human being in space; America's Alan Shepard follows the next month

1967 NASA launches the 36story Saturn V, then-and still-America's largest rocket

▼1969 Apollo 11, launched by a Saturn V, lands the first men on the me



₹1981 The U.S. launches the first space shuttle



explodes, killing seven astronauts; the next month the U.S.S.R. Jaunches the first component of the Mir space station



1995 First American ronaut flies aboard Mir ▼1998 Assembly begins of





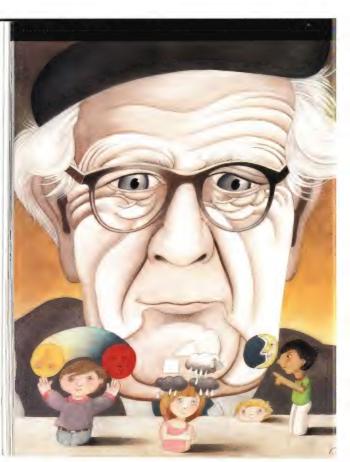
A Television Event 100 Years In The Making



Six Riveting Episodes with PETER JENNINGS

Beginning March 29 at 9/8c





#### CHILD PSYCHOLOGIST

#### He found the secrets of human learning and knowledge included behind the cute and seemingly illogical notions of children learning and knowledge hidden PIAGFT

PIAGET IN '23 REVERED BY TEACHERS



By SEYMOUR PAPERT

ean Piaget, the pioneering Swiss philosopher and psychologist, spent much of his professional life listening to children. watching children and poring over reports of researchers around the world who were doing the same. He found, to put it most succinctly, that children don't think like grownups. After thousands of interactions with young people often barely old enough to talk, Piaget began to suspect that behind their cute and seemingly illogical utterances were thought processes that had their own kind of order and their own special logic. Einstein called it

N Aug. 9, 1896 1907 Publishes first

1955 Establishes Center for Genetic Epistemo 1980 Dies in Geneva

a discovery "so simple that only a genius could have thought of it.

Piaget's insight opened a new window into the inner workings of the mind. By the end of a wide-ranging and remarkably prolific research career that spanned nearly 75 years-from his first scientific publication at age 10 to work still in progress when he died at 84-Piaget had devel-

PAGETS oped several SLIB JECTS new fields of INCLUDED HIS N THREE science: de-CHILDREN. velopmental

psychology, cognitive theory and what came to be called genetic epistemology. Although not an educational reformer, he championed a way of thinking about children that provided the

foundation for today's education-reform movements. It was a shift comparable to the displacement of stories of "noble savages" and "cannibals" by modern anthropology. One might say that Piaget was the first to take children's thinking seriously. Others who shared this re-

spect for children-John Dewey in the U.S., Maria Montessori in Italy and Paulo Freire in Brazil-fought harder for immediate change in the schools, but Piaget's influence on education is deeper and more pervasive. He has been revered by generations of teachers inspired by the belief that children are not empty vessels to be filled with knowledge (as traditional pedagogical theory had it) but active builders of knowledge-little scientists who are constantly creating and testing their own theories of the world. And though he may not be as famous as Sigmund Freud or even B.F. Skinner, his contribution to psychology may be longer lasting. As computers and the Internet give children greater autonomy to explore ever larger digital worlds, the ideas he pioneered become ever more relevant

Piaget grew up near Lake Neuchâtel in a quiet region of French Switzerland known for its wines and watches. His father was a professor of medieval studies and his mother a

[He is] one of the two towering figures of 20th century psychology.

BRUNER. Founder of the Harvard Center for Cognitive

strict Calvinist. He was a child prodigy who soon became interested in the scientific study of nature. When, at age 10. his observations led to questions that could be answered only by access to the university library. Piaget wrote and published a short note on the sighting of an albino sparrow in the hope that this would influence the librarian to stop treating him like a child. It worked. Piaget was launched on a path that would lead to his doctorate in zoology and a lifelong conviction that the way to understand anything is

to understand how it evolves. After World War I, Piaget became interested in psychoanalysis. He moved to Zurich,

### THIS METLIFE DISABILITY INCOME QUIZ CAN HELP YOU ANTICIPATE LIFE'S NASTY SURPRISES.

If you ever have to stop working due to disability, you'll be glad you stopped to read this first. Because when you're sick or injured, your bills keep coming. And what then? When you think about it, you insure your car and your house. Why not your income? This quiz can help you see how prepared you are for the unexpected.

 If you became sick or injured and couldn't work for three months or more, would your income stop?

2. Would you have to use your savings to pay your bills?

3. Could you lose your home?

If you answered "Yes" to any of these questions, talk to a MetLife financial professional. We can sit down with you and show you how to protect your income. That way, you'll have peace of mid and financial security when you're sick or injured and can't work. Call us at 1-800-MetLife for our free Life Advice brochure, About Disability Income Protection. Or visit our website at www.metlife.com.

YES

NO



GET MET. IT PAYS.
1-800-MetLife

www.metlife.com

These publices provide casability motive insurance only. They on NOT convide basic hospital, basic metical or many medical invariance as additional by the New Yeak State insurance population in the expected severel and or these populations of invast State (see a value to the population of the state or the expected severel and the state of the state or the state of the state or the state of the state or the state of th

molete details. © 1998 Metropolitan Life Insurance Co., NY, NY 98082 MOZ MLIC-LD

Back in Switzerland, the young scientist began watching children play, scrupulously recording their words and actions as their minds raced to



coherent within the framework of the child's way of knowing. Classifying them as "true" or "false" misses the point and shows a lack of respect for the child. What Piaget was after was a theory that could find in the wind dialogue coherence, ingenuity and the practice of a kind of explanatory principle (in this case by referring to body actions) that stands young children in very good stead when they don't know enough or have enough skill to handle the kind of explanation that grownups prefer.

Piaget was not an educator and never enunciated rules about how to intervene in such situations. But his work strongly suggests that the automatic reaction of putting the child right may well be abusive. Practicing the art of making theories may be more valuable for children than achieving meteorological orthodoxy; and if their theories are always greeted by "Nice try, but this is how it really is ... " they might give up after a while on making theories. As Piaget put it, "Children have real understanding only of that which they invent themselves, and each time that we try to teach them something too quickly, we keep them from reinventing it themselves.

Disciples of Piaget have a tolerance for—indeed a fascination with—children's primitive laws of physics: that things disappear when they are out of sight; that the moon and the sun follow you around; that big things float and small things sink. Einstein was especially intrigued by Piaget's

finding that seven-year-olds insist that going faster can take more time—perhaps because Einstein's own theories of relativity ran so contrary to common sense.

lthough every teacher in training memorizes Piaget's four stages of childhood development (sensorimotor, preoperational, concrete operational, formal operational), the better part of Piaget's work is less well known, perhaps because schools of education regard it as "too deep" for teachers. Piaget never thought of himself as a child psychologist. His real interest was epistemology-the theory of knowledgewhich, like physics, was considered a branch of philosophy until Piaget came along and made it a science.

Piaget explored a kind of epistemological relativism in which multiple ways of knowing are acknowledged and exA LIFETIME SPENT LISTENING TO CHILDREN HELPED HIM UNRAVEL THEIR THOUGHT PROCESSES

amined nonjudgmentally, yet with a philosopher's analytic rigor. Since Plaget, the territory has been widely colonized by those who write about women's ways of knowing, even the computer's ways of knowing, leven the computer's ways of knowing. Indeed, artificial intelligence and the information-processing model of the mind owe more to Plaget than its proponents may realize.

The core of Piaget is his belief that looking carefully at how knowledge develops in children will elucidate the nature of knowledge in general. Whether this has in fact led to deeper understanding remains, like everything about Piaget, controversial. In the past decade Piaget has been vigorously challenged by the current fashion of viewing knowledge as an intrinsic property of the brain. Ingenious experiments have demonstrated that newborn infants already have some of the knowledge that Piaget believed children constructed. But for those, like me, who still see Piaget as the giant in the field of cognitive theory, the difference between what the baby brings and what the adult has is so immense that the new discoveries do not significantly reduce the gap but only increase the mystery.

> M.I.T. professor Seymour Papert, creator of the Logo computer language, worked with Piaget in Geneva



DR. MARIA MONTESSORI In her schools, teachers get out of the way and students learn at their own rate.

find reasons for why things are the way they are. In one of his most famous experiments, Piaget asked children, "What makes the wind?" A typical Piaget dialogue: Piaget: What makes the

wind?

Julia: The trees.

P: How do you know?

J: I saw them waving their arms.

P: How does that make the wind?

I (waving her hand in

front of his face): Like this.
Only they are bigger. And
there are lots of trees.

P: What makes the wind

on the ocean?

J: It blows there from the

land. No. It's the waves ...
Piaget recognized that fiveyear-old Julia's beliefs, while not correct by any adult criterion, are not "incorrect" either. They are entirely sensible and

#### **NOAM CHOMSK**

efore Chomsky showed up in the 1950s, linguistics was concerned mostly with how languages evolve over time. His radical notion, deduced from the way we make sentences, was that our ability to communicate through language is rooted in the brain's basic wiring. This once controversal idea has been verified by

roversial idea has been we neuro Chorr equal far-le thoug drifte

neurobiologists; Chomsky's equally radical far-left politics, though, have drifted ever farther from the mainstream.







It was the first of its kind. And the kind of original that continues to inspire original thinking, Like

# There's no place











Or a thousand cupholders, or so it seems. Or a de-icer that helps prevent your wipers from getting

# There's no place







the ES model. But no matter how you choose to furnish yours, it's Caravan, sweet Caravan. And there's

There's no place

## **100**

# A Century of

Fruit flies and biplanes. Pap smears and CAT scans. Radar and lasers. Insulin, penicillin, LSD and ESP. Artificial hearts. Artificial intelligence. A few of the advances that powered this extraordinary century

-By Andrea Dorfman and Mary Hart

1900

1900 Sigmund Freud publishes The Interpretation



1900 Max Planck presents his quantum theory at a meeting of the German Physical Society in Berlin 1901 Austrian physician

1901 Austrian physician
Kart Landsteiner shows that
there are at least three types
of human blood, which he
labels A, B and O. These
distinctions make blood
transfusions possible.
Landsteiger will also discover
the Rh factor.



1902 Scottish cardiologist James Mackenzie invents the polygraph machine, better known as the lie detector

known as the lie detector

1903 Marie Curie shares
the Nobel Prize for Physics
with Henri Becquerel and
her husband Pierre for
their discovery of radioactivity; she will win a
second Nobel, for
Chemistry, in 1911, for
isolating the radioactive
feement radium



1903 The Flyer a pane built by American inventors Wilbur and Ornile Wright, makes the first powered flight



1906 British biochemist Frederick Hopkins postulates that "accessory food factors" are required for human health, these are now known as vitamins

1906 German neurologist Alois Alzheimer identifies a disorder that causes the progressive loss of intellectual functioning



1907 Italian educator Maria Montessori establishes her first preschool, in Rome

1907 Belgian-American chemist Leo Baekeland patents Bakelite, the world's first true plastic

1908 Hans Geiger invents a machine that translates invisible nuclear radiation into audible clicks 1910

1910 German bacteriol
Paul Ehrlich uses
a form of arsenic
to combat
syphilis; his
work forms the
basis of
modern
chemotherapy

1910 Working with fruit files, U.S. biologist Thomas Hunt Morgan discovers that some genetic traits are sex-linked and that the genes governing these traits are located on

chromosomes
1910 Publication of Volume I of Principia Mathematica, a three-volume work by Bertrand Russell and Alfred North Whitehead that attempts to link mathematics and logic



IMAGE OF GOLD ATOM

1911 Ernest Rutherford, Hans Geiger and Ernest Marsden discover the structure of the atom 1911 Austrian-American

physicist Victor Hess detects radiation coming from outer space; it is later dubbed

cosmic

COSMIC-RAY DETECTOR 1911 Hiram Bingham finds Machu Picchu, a 15th century Inca settlement high in the Peruvian Andes

the Peruvian Ande 1912 German meteorologist Alfred Wegener proposes the theory of continental drift

continental drift
1912 Charles
Dawson announces that
he has found the fossilized
temains of a human-like
creature on Pittown
Common in

Common in Sussex, England. Christened Eoanthropus dawsoni, \*Piltdown Man" will be exposed as a fraud in 1953

1913 Dr. Albert Schweitzer, a missionary, opens a hospital in Lambaréné, French Equatonal Africa (n Gabon), for the treatment of

Gabon), for the treatment of leprosy and sleeping sicking 1914. The Panama Canal, which links the Atlantic and Panish oceans, opens to

commercial traffic

1914: Authorities
institutionalize Mary Mallic
a cook popularly known as
"Typhoid Mary," whose
handling of food had led to
at least 51 cases of the

disease and three deaths since 1904

1916 Albert Einstein publishes his general theory of relativity

1917 U.S. astronomer George Hale builds a 100reflecting telescope—the world's largest—on California's Mount Wilson 1918 American astronom Harlow Shapley descrip-

Harlow Shapley describsize and structure of the Milky Way galaxy

# Science

1922 British archaeologist

Howard Carter opens the

little-known pharach who

1924 French

physicist Louis

de Broglie

as both a

notion will lead to the

lectron microscope

1925 The teaching of

Tennessee

panciple\*

evolution comes under fire at

the Scopes "monkey trial" in

1926 American physicist

first successful launch of a

1927 Werner Heisenberg

devises his "uncertainty

liquid-fueled rocket

Robert Goddard conducts the

describes his

theory that all

matter behaves

particle and a

died in 1325 B.C





and priest Georges Lemaître proposes that the universe began with a big bang, the explosion of a highly condensed mass, which he refers to as a "cosmic egg"

1928 Scottish bacteriologist Alexander Fleming discovers penicillin

1928 American anthropologist Margaret Mead publishes Coming of Age in Samoa 1928 Greek-American

Papanicolaou develops the Pap smear, a screening test for cervical and uterine

1928 Hungarian-born biochemist Albert Szent-Gyorgyi isolates vitamin C 1929 U.S. astronomer Edwin Hubble provides

evidence that the universe is expanding 1929 American physicist

Ernest Lawrence dreams up the cyclotron, the first atom smasher

1930 U.S. astronome Clyde Tombaugh discovers

Pluto, the ninth planel 1930 Austrian physicist Wolfgang Pauli proposes the

> 1933-35 Teams in Germany and Britain independently invent radar

1934 French physicists frène

and Frédéric Joliot-Curie artificially induce radioactivity

1935 U.S. seismologist Charles Richter develops a scale for measuring the strength of earthquakes

1935 Austrian zoologist Konrad Lorenz describes the process of imprinting, during which young birds attach themselves to a being or an



1935 First use of lobotomy to treat mental illness 1936 John Maynard Keynes publishes The General Theory

of Employment, Interest and Money 1938 in Italy. electroconvulsive therapy-

controlled electric shocks that cause temporary loss of consciousness and seizureis first used on mental nationic

1938 After analyzing decades of temperature readings, British engineer vee Callendar describes what is later known as the



1939 First flight by a jet Ernst Heinkel

1939 Swiss chemist Paul Müller determines that DDT is a powerful insecticide

1940 French boys searching for their dog stumble onto the Lascaux cave, whose walls are covered with spectacular paintings and engravings

dating from the Ice Age 1940 American surgeon Charles Drew devises a method for long-term storage of blood plasma, which can then be used for transfusions

1941 U.S. researchers Lyle Goodhue and William Sullivan adapt an earlier idea for dispersing liquids and powders in a spray. Result: the aerosol can

1942 A team headed by Italian physicist Enrico Fermi produces the first nuclear chain reaction

1942 Frenchmen Jacques-Yves Cousteau and Emile Gagnan perfect the Aqua Lung, a self-contained underwater breathing apparatus, or scuba

1942 Germany successfully launches the V-2, a surface-to-surface missile developed with the help of rocket scientist Wernher

von Braun 1943 British mathematician and

cryptographer Alan Turing helps build an electronic computer, the Colossus, that will be used by the Allies to crack German codes 1943 Dutch physician

Willem Kolff invents the dialysis machine, used to patient's kidneys malfunction



epidemic kills more than 25

million people, including

1919 British physicist splits an atom

1921 Swiss psychiatrist

introduces the inkblot test

1921 Canadian physician Frederick Banting and colleagues find a treatme for diabetes: insulin isolated from the pancreas of

Ernest Rutherford artificially

355



in clay jars in Israel's

Oumran Cave, overlooking

ב שולבי ביווניייי

DEAD SEX SCHOOL

1947 American Edwin Land

demonstrates the Polaroid

ethnologist Thor Heyerdahl

sails from Peru to Polynesia

on the wooden raft Kon-Tiki

to support his theory that

pre-Incan peoples reached

1947 U.S. Air Force test

breaks the sound barrier

Rell Laboratories led by

William Shockley, John

invents the transistor

1947 A research team at

Bardeen and Walter Brattain

1947 U.S. chemist Willard

Libby develops radiocarhon

dating, which can determine

the age of objects made of

organic materials, such as

wood and bone

pilot Charles (Chuck) Yeager

South Pacific islands by sea

camera he invented

1947 Norwegian

and colonized them

swallowing synthetic LSD. Swiss chemist Albert Hofmann discovers the drug's hallucinogenic effects

1943 Publication of Being and Nothingness establishes Jean-Paul Sartre as the leading French existentialist

1944 In Mexico, American plant pathologist Norman Borlaug starts developing high-yield grains that, two decades later, will fuel the green revolution

1945 U.S. pilots cruising

at high altitudes discover powerful west-to east wind systems, later called jet streams. 1945 U.S. planes drop atom bombs on Hiroshima and Nagasaki

1945 The U.S. Public Health Service begins adding fluoride to the water supply in order to reduce the incidence of tooth decay

1945 Raytheon technician Percy Spencer accidentally discovers microwave cooking when microwave signals met a candy bar in his pocket



John Eckert unveil ENIAC, the first fully electronic computer 1946 American

1948 The U.S. Air Force starts Project Blue Book to gather data on uso sightings pediatrician Benjamin Spock 1948 Alfred Kinsey publishes The Common Sense Book of Baby and Child Care the Human Male

Douglas Bevis describes amniocentesis, a prenatal test for genetic abnormalities 1952 U.S. virologist Jonas Salk develops the first

effective polio vaccine 1952 British chemist Rosalind Franklin's X-ray photographs of DNA show that the molecule has a helical structure

1952 The first sex-change operation is performed on a patient named George Jorgenson, later known as Christine Jorgenson 1953 James

Watson and Francis Crick announce that they have deciphered the structure of psa

1954 U.S. endocrinologists Gregory Pincus, John Rock and C.R. Garcia develop the birth-control pill

1956 The U.S. explodes a hydrogen bomb at Bikini Atoll, in the South Pacific

1957 A new sleeping pill, thalidomide, is prescribed in Britain and Germany, It is later found to cause severe birth defects and taken of the market

1957 Soviets send the first artificial satellite Sputnik, into orbit around

1958 John Kenneth Galbraith publishes The Affigent Society

1958 Electrical engine Wilson Greatbatch inves the first implantable can pacemaker; it is powered to a zinc-mercury battery



1959 In Tanzania's Olduvar Gorge, Mary Leakey finds the fossilized skull of a human ancestor who lived 1.8 million

wears ago 1959 Engineer Robert Noyce makes the first integrated circuit, or microchip

1959 Marvin Minsky and John McCarthy establish the Artificial Intelligence Laboratory at M.I.T.

Trieste descends 35.800 ft. in the Mariana Trench to the deepest spot in the oceans 1960 U.S. physicist Theodore Maiman builds a

working laser 1960 British ethologist Jane Goodall begins studying chimpanzee behavior in

1960 The discovery of an 11th century Norse settlement at L'Anse aux Meadows. Newloundland, confirms that Europeans reached the New World centuries earlier than Columbus did

1961 American astronomers Allan Sandage and Thomas Matthews discover quasars

1962 U.S. marine biologist Rachel Carson publishes Silent Spring 1963 The tranquilizer Valium is introduced

1964 The U.S. Surgeon General first warns that smoking can be hazardous to human

1964 U.S. surgeon Michael DeBakey performs the first successful coronary-artery

1965 American radio astronomers Arno Penzias and Robert Wilson accidentally discover cosmic background radiation, which bolsters the Big Bang theory of the origin of the universe

1967 R. Buckminster Fuller's geodesic dome is a hit at the Montreal Exposition 1967 South African surgeon Christiaan Barnard performs heart transplant; his patient.

Louis Washkansky, survives 1969 American astronauts

walk on the moon 1969 Swiss-born psychiatrist Elisabeth Kübler Ross publishes On Death

and Dying

Linus Pauling touts vitamin C as a cure for everything from cancer to the common cold 1971 British engineer Godfrey Hounsfield invents the computerized tomography scanner (CAT scan), which builds a 3-D

image of the brain 1972 U.S. bans por because of its adverse effects on the environment

1974 Farmers discover an army of life-size terra-cotta human figures in a 3rd century B.C. Chinese emperor's tomb near Xian

1974 Arthur Laffer formulates his supply-side economic theories, which hold that reducing federal taxes spurs economic growth and eventually increases. federal revenues

FIRST MOON WALK:

197 come

197 new b

197 water supp

197 angic 197

world 197 chlor are u

198 aster

wiped other the p is fou

974 In Hadar, Ethiopia onald Johanson and bleagues find a 3.2 millionsar-old skeleton of a new uman ancestor, later called ystralopithecus afarensis; it

975 Scientists discover a atural opiate, now known as endorphin (endogenous torphine), in the brain

976 The first supersonic ommercial airplane, the 977 An unusual incidence

childhood arthritis in me, Conn., leads a group of ele physicians to identify a ew bacterial disease ansmitted by ticks

977 Deep-sea vents are und near the Galápagos lands. The hot, sulfurous ater around the vents apports new species of

acteria and sea life 977 Doctors use balloon reioplasty to unclog a oronary artery 978 Louise Brown, the orld's first test-tube baby, is

orn in England 978 To protect Earth's one layer, the U.S. bans Horofluorocarbons, which e used as propellants

980 Luis and Walter

varez speculate that an steroid's crashing into arth 65 million years ago iped out the dinosaurs and ther species. In 1991 e putative impact crater found beneath Mexico's icatán peninsula

1980 The World Health Organization declares that smallpox has been eradicated

1981 Inaugural flight of America's space shuttle 1981 Doctors in Los

Angeles alert the Centers for Disease Control to five cases of Pneumocystis carinii pneumonia in gay men, one of the earliest signs of the ADS epidemic

1982 The U.S. Food and Drug Administration approves the first genetically engineered drug: bacteriaproduced insulin for diabetics

1982 Surgeons at the

Center, led by William

DeVries, replace Barney

Clark's failing heart with a

Robert Jarvik: Clark dies

1984 Alec Jeffreys and

"genetic fingerprinting,

ILS National Cance

colleagues at the University

of Leicester, England, develop

which uses unique sequences

of DNA to identify individuals

1985 Robert Gallo, of the

Institute, and Luc Montagnier,

of France's Pasteur Institute,

each publish the genetic

sequence of the AIDS VITUS The two are identical

112 days later

mechanical one designed by

University of Utah Medical

1985 French and American oceanographers find the Titanic at a depth of nearly 13,000 ft. in the Atlantic 1986 The U.S. space

shuttle Challenger explodes 73 sec. after lift-off 1986 An explosion at an

aging nuclear reactor in Chernobyl, Ukraine, releases radiation into the atmosphere 1987 The U.S. Food and Drug Administration approves the antidepressant Prozac

1988 A Brief History of Time, by British physicist Stephen Hawking, becomes a surprise best selle

also known as "Dr. Death," performs his first assisted

1991 Tourists Alps discover, protruding from a glacier, the remains of a

3300 B.C 1993 Princeton mathematician Andrew Wiles reveals his proof for Fermat's Last Theorem, which was

1990 Jack Keyorkian

hiking in the Tyrolean man who died about

proposed in the 17th century

1994 Comet Shnemaker-Levy 9 crashes into the planet

1994 Near France's Ardèche River explorers discover the Chauvet cave, whose paintings are more than 30,000 years old

1996 A British government report on "madcow disease" raises questions about the safety of British

1996 NASA reports that a Martian meteorite may contain the remains of ancient microbes. The

evidence is later challenged 1997 Southish researchers clone a sheep named Dolly from cells of an adult ewe 1997 A computer called Deen Blue beats world chess

champion Garry Kasparov in a six-game match 1997 NASA'S Sojourner spacecraft roams the surface of Mars and sends pictures

back to Earth 1998 The impotence drug Viagra goes on sale in the U.S.



On Jan. 1 a coding error could cause computers around the world to malfunction

receives the first patent for a genetically engineered animal 1988 The French povernment

1988 Harvard

approves use of RU 486, the socalled abortion pill

1989 The tanker Exxon Valdez runs aground in Alaska's Prince William Sound, spilling 11 million gal, of crude oil, It is the worst oil spill in U.S. history

1990 Formal start of the Human Genome Project, an

international effort to man and sequence all human DNA 1990 Launch of the Hubble Space Telescope. It fails to operate property, but is repaired three years later by space-walking astronauts

1993 Researchers at George Washington University clone human embryos and nurture them in





sliding doors on both sides. Or Easy Out Roller Seats\* that make reconfiguration an easy exercise.

### like Çaravan.



frozen to the windshield. Or all-wheel drive. Or the

addition this year of a standard 3.8L V-6 in

### like Caravan.





Caravan The New Dodge

still nothing quite like it.

1-800-4-A-DODGE or www.4adodge.com

### like Caravan.

\$17,800\* Avenger Sport features a tot of equipment for one low price. You get a powerful sequential multi-point, fuelinjected V-6 with 24 valves at no extra charge. Plus a four-speed automatic with selectable oventrive, power windows and door locks, air, and AMFM sterpe cassette.

And disc brakes at all four wheels to stop you. Like we said, it's all included.
You also get a double-wishbone suspension that helps optimize the delicate relationship between a quiet, comfortable ride and quick.
predictable handling.
Bit 16" tires, which enhance

passengers have the luxury of room. And because the seats are elevated, theater-style, Avenger gives everyone a great look at the road. Now that's a good Sport.

> \*MSRP after \$1000 cash allowance exclude star. Based on MSRP decount was very seat belts. Remember a bases and extrematest place for indiden.



Avenger The New Dodge

800-4-A-DODGE or www.4adodge.com

### THE IQ MERITOCRACY

Our test-obsessed society has Binet and Terman to thank-or to blame



By NICHOLAS LEMANN

Frenchman, the psychologist Alfred Binet, published the first standardized test of human intelligence in 1905. But it was an American, Lewis Terman, a psychology professor at Stanford, who thought to divide a test taker's "mental age," as revealed by that score, by his or her chronological age to derive a number that he hard to think of a pop-scientific coinage that has had a greater impact on the way people think about themselves and other pace on the way people think about themselves and other themselves and the standard to the standard themselves and the standard themselves and the standard themselves and the standard themselves and the standard themselves are standard to the standard themselves and the standard themselves are standard to the standard themselves and the standard themselves and the standard themselves are standard to the standard themselves are standard to the standard themselves and the standard themselves are standard to the standa

No country embraced the IQ—and the application of IQ testing to restructure society—more thoroughly than the U.S. Every year millions of Americans have their IQ measured, many with a direct descendant of Binet's original test, the Stanford-

Binet, although not necessarily for the purpose Binet intended. He developed his test as a way of identifying public school students who needed extra help in learning, and that is still one of its leading uses. But the broader and more controversial use of IQ testing has its roots in a theory of intelligence—part science, part sociology—that developed in the late 19th century, before Binet's work and entirely separate from it. Championed first by Charles Darwin's

eloped in the late 19th century, bestrands and entirely separate from
INTELIGENCE
prioned first by Charles Darwin's
rancis Galton, it held that intelligence was the most valuable

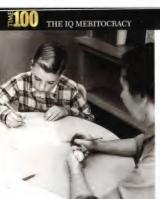
ARMY RECRUITS TAKE AN IQ EXAM IN

1917 AS PART OF

THE FIRST MASS

cousin Francis Calton, it held that intelligence was the most valuable human attribute, and that if people who had a lot of it could be identified and put in leadership positions, all of society would benefit. Terman believed IQ tests should be used to conduct a great

sorting out of the population, so that young people would be assigned on the basis of their soors to particular levels in the school system, which would lead to corresponding socioeconomic destinations in adult life. The beginning of the [O-testing movement overlapped with the eugenics movement—hugely popular in America and Europea among the "Better sort" blore Itiliter gave it a bad name—which held that intelligence was mostly inherited and that people deficient in it should be discouraged from reproducing. The state sterilization that Justice Oliver Wendell Holmes



notoriously endorsed in a 1927 Supreme AFTER WORLD WAR II. TESTING BECAME SO WIDESPREAD THAT EVERYONE KNEW WHAT A NO. 2

PENCIL WAS FOR persuaded the Army to give IO tests to 1.7 million inductees. It was the world's first mass administration of an intelligence test. and many of the standardized tests in use today can be traced back to it: the now ubiquitous and obsessed-over SAT; the Wechsler, taken by several million people a year, according to its publisher; and Terman's own National Intelligence Test, originally used in tracking elementary school children. All these tests took from the

Army the basic technique of measuring intelligence mainly by asking vocabulary questions (synonyms, antonyms, analogies, reading comprehension). In 1958 a British sociologist

named Michael Young coined the word "meritocracy" to denote a society that organizes itself according to IQ-test scores. That term too has entered the language, though it doesn't have quite the market penetration that IO does-or the disparaging overtone that Young intended in his satiric fable The Rise of the Meritocracy, 1870-2033. Terman and many other early advocates of IQ testing had in mind the creation of an American meritocracy, though the word didn't exist then. They believed IO tests could be the means to create, for the first time ever, a society in which advantage would go to the people who deserved it rather than to those who had been born into it.

> n order to believe this. though, you have to believe that merit and a score on an IO test are the same thing. Long before IO was invented. America prided itself on

being a country without a class system, in which the talented and industrious would rise and be rewarded. The advent of intelli gence tests did not dramatically affect the degree of social mobility in the U.S .- at least not enough for any change to show up in the social-science data. If IO tests measure a trait that is genetic. and therefore inherited, or a trait that is culturally transmitted by parents and social class, they would, either way, be unlikely to upend the social order in every generation. And they haven't.

What they have done, though, is create a kind of minimeritocracy for a few people who are very high in one ability. If you score in the top 1% on IQ tests, a system is in place in this country that is amazingly good at finding you and offering you access to a first-class education that can often lead to first-class job opportunities. People with very high IQs don't necessarily run the country; they do, however, usually have access to a privileged and protected position.

It was the use of IQ tests to limit the opportunities of most other people that led to the anti-IO rebellion that broke out in the last third of the century. It was probably most intense in Britain, whose public schools at midcentury had adopted a particularly severe system of sorting by test at age 11. By 1971 the U.S. Supreme Court had banned the use of IQ tests in employment except in very rare cases.

But the point is not how much the use of IQ testing has been curtailed but how widespread it still is. IQ tests are more consequential in schools and the military, where large numbers of people have to be processed quickly, than they would be at work, where it's easier to demonstrate ability through performance over time. They also have a more pronounced effect on the lives of people who score very low or very high than on the lives of people in the middle. Still, it's hard to grow to adulthood in the U.S. without ever having taken an IO-derived standardized test (any test that has words like "ability" or "aptitude" or "reasoning" in its name). In a country with an unusually decentralized education system in which you can't be sure who is studying what where, IQ tests are the easiest way of making straight-up national comparisons.

What we've decided now is that we'll identify, assess and honor a much wider range of human abilities than just whatever it is that IO tests measure. That's the theory. The practice is that IQ testing-cheap, consistent and established-is still ubiquitous. Even the attempts to supplant it pay IQ the tribute of accepting its frame of reference. We have got used to trying to understand what goes on inside people's head in terms of "intelligences" and "quotients," and there doesn't seem to be any way to put that particular horse back in the barn.

Nicholas Lemann is a staff writer for the New Yorker; his book on meritocracy is scheduled to be published in September

Court decision (with the slogan "Three generations of imbeciles are enough") was done with an IQ score as justification

The American IQ promoters scored a great coup during World War I when they

LEWIS TERMAN di



## EXANDER

A spore that drifted into his lab and took root on a culture dish started a chain of events that altered forever the treatment of bacterial infections

By DR. DAVID HO

he improbable chain of events that led Alexander Fleming to discover penicillin in 1928 is the stuff of which scientific myths are made. Fleming, a young Scottish research scientist with a profitable side practice treating the syphilis infections of prominent London artists, was pursuing his pet theory-that his own nasal mucus had antibacterial effects-when he left a culture plate smeared with Staphylococcus bacteria on his lab bench while he went on a two-week holiday.

When he returned, he noticed a clear halo surrounding the yellow-green growth of a mold that had accidentally contaminated the plate. Un-

hted by King 1945 Shares Nobel Prize and Chain 1955 Dies of a heart attack March II in London known to him, a spore of a rare variant called Penicillium notatum had drifted in from a mycology lab one floor below. Luck would have it that Fleming had decided not to store his culture in a warm incubator, and that London was then hit by a cold spell, giving the mold a chance to grow. Later. as the temperature rose, the Staphylococcus bacteria grew like a lawn, covering the entire plate-except for the area surrounding the moldy contaminant. Seeing that halo was Fleming's "Eureka" moment. an instant of great personal insight and deductive reasoning. He correctly deduced that the mold must have released a substance that inhibited the growth of the bacteria.

It was a discovery that would change the course of history. The active ingredient in that mold, which Fleming named penicillin, turned out to be an infection-fighting agent of enormous potency. When it was finally recognized for what it was-the most efficacious life-saving drug in the worldpenicillin would alter forever the treatment of bacterial infections. By the middle of the century. Fleming's discovery had spawned a huge pharmaceutical industry, churning out synthetic penicillins that would conquer some of mankind's most ancient scourges, including syphilis, gangrene and tuberculosis.

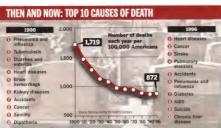
Fleming was born to a



FLEMING IN HIS LAB, HOLDING THE MOLD THAT MADE HIM FAMOUS

Scottish sheep-farming family in 1881. He excelled in school and entered St. Mary's Hospital in London to study medicine. He was a short man, usually clad in a bow tie, who even in his celebrity never mastered the conventions of polite society. Fleming probably would have remained a quiet bacteriologist had

serendipity not come calling that fateful September in 1928. In fact, Fleming was not even the first to describe the antibacterial properties of Penicillium, John Tyndall had done so in 1875 and, likewise. D.A. Gratia in 1925, However, unlike his predecessors, Fleming recognized the importance of his findings. He would later



say, "My only merit is that I did not neglect the observation and that I pursued the subject as a bacteriologist." Although he went on to perform additional experiments, he never conducted the one that would confuse the conducted the one that would confuse the conducted the conducted to the conducted the conducted to the cond

y 1932, Fleming had abandoned his work on penicillin. He would have no further role in the subsequent development of this or any other antibiotic, aside from happily providing other researchers with samples of his mold. It is said that he lacked both the chemical expertise to purify penicillin and the conviction that drugs could cure serious infections. However, he did safeguard his unusual strain of *Penicillium* notatum for posterity. The baton of antibiotic development was passed to others. In 1939 a specimen of

Fleming's mold made its way into the hands of a team of scientists at Oxford University led by Howard Florey, an Australian-born physiologist This team had technical talent, especially in a chemist named Ernst Boris Chain, who had fled Nazi Germany. Armed with funding from the Rockefeller Foundation, these scientists made it their objective to identify and isolate substances from molds that could kill bacteria. The mission was inspired by the earlier work of Gerhard Domagk, who in 1935 showed that the injection of a simple compound, Prontosil, cured systemic **BY THE 1940S** 

streptococcal infections. This breakthrough demonstrated that invading

PENICILLIN
WAS BEING
MASSPRODUCED IN
LABS LIKE
THIS ONE IN
NEW JERSEY

bacteria could be killed with a drug and led to a fevered search in the late 1930s for similar compounds. Fleming's Penicillium notatum became the convenient starting point for Florey's team at Oxford.

In a scientific tour de force, Florey, Chain and their colleagues rapidly purified penicillin in sufficient quantity to perform the experiment that Fleming could not successfully treating mice that had been given lethal doses of bacteria. Within a year, their results were published in a seminal paper in the Lancet. As the world took notice, they swiftly demonstrated that injections of penicillin caused miraculous recoveries in patients with a variety of infections.

The Oxford team did not stop there. Rushing to meet the needs of World War II. they helped the government set up a network of "minifactories" for penicillin production. Florey also played a crucial role in galvanizing the large-scale production of penicillin by U.S. pharmaceutical companies in the early 1940s. By D-day there was enough penicillin on hand to treat every soldier who needed it. By the end of World War II, it had saved millions of lives.

Pneumonia, syphilis, gonorrhea, diphtheria, scarlet fever and many wound and childbirth infections that once killed indiscriminately suddenly became treatable. As deaths caused by bacterial in-



People have called it a miracle. For once in my life as a scientist, I agree. It is a miracle, and it will save lives by thousands.

SIR ALEXANDER FLEMING, on the lifesaving potential of penicillin insight of a single individual

than the technical feats of a

team of scientists. wards and accolades came to Fleming in rapid succession, including a knighthood (with Florey) in 1944 and the Nobel Prize for Medicine (with Florey and Chain) in 1945. By this time, even Fleming was aware that penicillin had an Achilles' heel. He wrote in 1946 that "the administration of too small doses ... leads to the production of resistant strains of bacteria." It's a problem that plagues us to this day When he died of a

heart attack in 1955 he was mourned by the world and buried as a national hero in the crypt of St. Paul's Cathedral in London, Although Fleming's scientific work in and of itself may not have reached greatness, his singular contribution changed the practice of medicine. He deserves our utmost recognition. At the same time, we must bear in mind that the "Fleming Myth," as he called it, embodies the accomplishments of many giants of antibiotic development. Fleming is but a chosen representative for the likes of Florey. Chain, Domagk, Selman Waksman and Réné Dubos. many of whom remain, sadly,

we commemorate them all. Dr. David Ho is director of the Agron Diamond AIDS Research Center in New York City and TIME's 1996 Man of the Year

virtual unknowns. Their achievements have made the world a better, healthier place. In commemorating Fleming,

#### FIGHTING AIDS Pen illin was the magic bullet against bacteria, but what will stop HIV?

didn't exist. Fifteen years ago, a few doctors and public health officials noticed the first cases. Within a few years, it was clear that it had reached epidemic status. It has now killed almost 14 million

people around the world. Four years ago, doctors came up with the first treatment to make a dent in the spiraling death rate. Today that treatment works for some natients but it's not clear how long the results will last. And

still there is no cure For the nearly 35 million neonle around the world now living with HIV, there may

never be a cure. Once cells are infected with HIV, it's excruciatingly difficult-perhaps impossible-to rid them of the virus. The only sure way to stop the epidemic is to prevent infection in the first place, and only a vaccine can do that

Unfortunately, HIV is one of the most changeable viruses known to science. After more than a dozen years, researchers are still chasing the moving target through all its mutations trying to find a few common elements among all the strains

in circulation that they can use to concoct an effective vaccine So far about two dozen most made from proteins found on the virus' coat and delivered via another, inactivated virus such as canarypox. While

such vaccines are safe and successful in triggering antibodies it's not clear that any will be sufficiently rful to combat the strains of the

virus that are currently in Most of the formulations, for example, fail to get the body to churn out enough of the T cells that are needed to target and destroy HIV

fected cells Even without a ne, however, there is hope. The arsenal of treatment ontions has expanded considerably in recent years Antivirals given to pregnant

in preventing transmission to newborns, and a new, shorter treatment shows promise for use in developing nations.

For many older patients. protease inhibitors, available since 1995 and taken in combination with other antivirals, have kept HIV at below detectable levels. And while recent studies show that some HIV stubbornly hides from the drugs' reach, early evidence suggests that these sequestered strains may not be infectious. Drug holidays-brief respites from the grueling and complex medication regimenare also being studied, since some natients who have voluntarily stopped their therapy have experienced no

return of symptoms. The new drugs are not without their problems however. Patients may have to take them for the rest of their lives, and the expense and complexity of the regimen keep them out of reach for the 9 out of 10 patients who live in veloping nations

Still, the billions of dollars spent on AIDS research over the past 20 years has not been wasted. As scientists learn more about how HIV co-opts the human body to survive, they are realizing that drugs alone may not be enough. To contain the virus effectively, it may take a balance between drug therapy that keeps HIV levels low and a bolstered immune system that can then target and destroy the remaining virus. Until scientists find a vaccine, however they may control but never cure the century's final -By Alice Park scourge.

mothers have proved effective

#### IO DISCOVERED THE AIDS VIRUS?



NEW AIDS VIRUSES (GREEN

LUC MONTAGNIER

By Alice Park

ROBERT GALLO

#### **ASTRONOMER**

# HUBBLE

He saw a vast universe beyond the Milky Way, then found the first hints that it began with a Big Bang

By MICHAEL D. LEMONICK

uring the past 100 years, astronomers have discovered quasars, pulsars, black holes and planets orbiting distant suns. But all these pale next to the discoveries Edwin Hubble made in a few remarkable years in the 1920s. At the time, most of his colleagues believed the Milky Way galaxy, a swirling collection of stars a few hundred thousand light-years across

> BORN November 1889 in 1910 Enters Oxford as a

1919 Joins the staff of the

1923 Proves that the

IES Sept. 28, 1953

made up the entire cosmos. But peering deep into space from the chilly summit of Mount Wilson, in Southern California. Hubble realized that the Milky Way is just one of millions of galaxies that dot an incomparably larger setting. Hubble went on to trump

even that achievement by showing that this galaxystudded cosmos is expanding-inflating majestically like an unimaginably gigantic balloon-a finding that prompted Albert Einstein to acknowledge and retract what he called "the greatest blunder of my life." Hubble did nothing less, in short, than invent the idea of the universe and then provide the first evidence for the Big Bang theory, which describes the birth and evolution of the universe. He discovered the cosmos, and in doing so founded the science of cosmology.

Hubble's astronomical triumphs earned him worldwide scientific honors and made him the toast of Hollywood during the 1930s and 1940sthe confidant of Aldous Huxley and a friend to Charlie Chaplin, Helen Hayes and William Randolph Hearst. Yet nobody (except perhaps Hubble) could have imagined







HUBBLE NAVIGATED THE HEAVENS FROM HIS PERCH AT MOUNT WILSON

such a future when the 23year-old Oxford graduate began his first job, in New Albany, Ind., in 1913.

Hubble majored in science as an undergraduate at the University of Chicago, A tall, powerfully built young man, he excelled at basketball and boxing (fight promoters reportedly tried to talk him into turning pro), and his combination of academic and athletic prowess earned him a Rhodes scholarship to Oxford. In England, Hubble kept up his muscular pursuits: he fought, ran track and played on one of the first baseball teams ever organized in the British Isles.

is official academic focus shifted. thanks to a promise made to his dying father that he would study law rather than science (he also took up literature and Spanish). On his return to America, he took a position as a high school Spanish teacher Though he was popular with students-especially, according to Hubble biographer Gale Christianson, with the girls, who were evidently charmed by his affected British diction and "Oxford mannerisms"-Hubble longed to return to science.

After a year, he signed on

as a graduate student at Yerkes Observatory in Wisconsin and embarked on the work that would one day make him famous: studying faint, hazy blobs of light called nebulae (from the Latin word for cloud) that are visible through even a modest telescope.

Hubble's skills as an astronomer were impressive enough to earn him an offer from the pressigious Mount Wilson Observatory. World War I keep him from accepting right away, but in 1919 the newly discharged Major Hubble—as he invariably introduced himself—arrived at observatory headquarters, still in uniform but ready to start obtaining the most governed to early the start of the observatory headquarters, still in uniform but ready to start obtaining the most governed to earth.

Up on the mountain, Hubble encountered his greatest scientific rival, Harlow Shapley, who had already made his reputation by measuring the size of the Milky Way. Using bright stars called Cepheid variables as standardized light sources, he had gauged the galaxy as being an astounding 300,000 light-years across-10 times as big as anyone had thought. Yet Shapley claimed that the Milky Way was the whole cosmic ball of wax. The luminous nebulae were, he insisted, just what they looked like: clouds of glowing gas that were relatively nearby.

#### [Hubble's] discovery that the universe is expanding was one of the great intellectual revolutions of the 20th century.

STEPHEN HAWKING, A Brief History of Time

Hubble wasn't so sure And in 1924, three years after Shapley departed to take over the Harvard Observatory. Hubble found proof to the contrary. Spotting a Cepheid variable star in the Andromeda nebula. Hubble used Shapley's technique to show that the nebula was nearly a million light-years away, far beyond the bounds of the Milky Way. It's now known to be the fullfledged galaxy closest to our own in a universe that contains tens of billions of galaxies, "I do not know," Shapley wrote Hubble in a letter quoted by biographer Christianson, "whether I am sorry or glad to see this break in the nebular problem. Perhaps both." (Hubble was not entirely magnanimous in victory. To the end he insisted on using the term nebulae instead of Shapley's preferred galaxies.) Hubble's scientific reputa-

tion was made almost overnight by his discovery that the universe is vast and the Milky Way insignificant. But

OXFORD MADE HIM A RABID ANGLOPHILE; HIS FAVORITE EXPRESSION WAS "BY JOVE"

problem. For years, astronomers had noted that light from the nebulae was redder than it should be. The most likely cause of this so called red shifting was motion away from the observer. (The

he had already

moved on to a new

same sort of thing happens with sound: a police car's siren seems to drop in pitch abruptly

as the car races past a listener.) Hubble and his assistant,

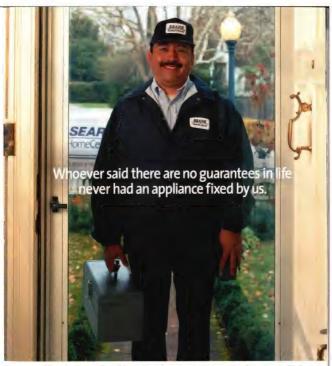
Milton Humason, began measuring the distances to these receding nebulae and found what is now known as Hubble's Law: the farther away a galaxy is from Earth, the faster it's racing away. Could it be that the universe as a whole is rapidly expanding? That conclusion was extraordinary, almost mind-blowing, yet seemed inescapable.

When Einstein heard of Hubble's discovery, he was elated. More than a decade earlier, his new general theory of relativity had told him that the universe must either be expanding or contracting, yet astronomers had told him it was doing neither. Against his better judgment, Einstein had uglied up his elegant equations with an extra factor he called the cosmological terma sort of antigravity force that kept the universe from collapsing in on itself.

ut suddenly, the cosmological term was unnecessary. Einstein's instincts had been right, after all. His great blunder had been to doubt himself, and in 1931. during a visit to Caltech, the great and grateful physicist traveled to the top of Mount Wilson to see the telescope and thank Hubble personally for delivering him from folly With the greatest scientif-

ic superstar of the age paving him homage. Hubble became





There's a reason Sears HomeCentral can guarantee every appliance repair. We know how well our people are trained. In fact, our 14,000 repair

how well our people are trained. In fact, our 14,000 repair specialists are so well-trained, we'll guarantee their work on any major brand appliance, no matter where you bought it.

So if you have an appliance problem, call someone who knows what they're doing. We'll fix it right, guaranteed.



1-800-4-MY-HOME

Today, 50,000 people will sign up for cell phone service (can your mother be far behind?).

148 million people might hop on the Internet.

900 million voicemail messages will be left (not necessarily returned). In the time it takes to read this, 5 million E-mails will be sent.

> There's a communications revolution going on. And one company is right in the center of it.

#### **Lucent Technologies** Bell Labs Innovations

600 Mountain Avenue Murray Hill, NJ 07974-0636



We make the things that make communications work."

Our star report.



The new Ford Windstar is the only vehicle to ever earn the highest safety rating in both front- and side-impact crash tests:

the quadruple five-star crash test rating.

\*\*\*\*

Five-Star Driver Front Crash Test Rating.

Five-Star Passenger Front Crash Test Rating.

Five-Star Front Seat Side Passenger Crash Test Rating.

Five-Star Rear Seat Side Passenger Crash Test Rating.

\*\*\*\* Each year, so pure of the New Car Assessment Program, the government has branchess care Pilotty year, as grant or time overs, air cassessment is beginning the government of the pilot and crashes them. The creats nest air designed to measure has well different rigini wit the size and schemes sheet. These and sense are designed as since and care we controlled while the provide treatal and sale crash protection to helical secupates. Pre-g-stars indicate the

ingrees pronounce nevel.
Intromal impact crash resump, vehicles are crashed into a treat barner at Wantesper hour. the enter driving at 20 miles per bur head on mo an identical parket visites. In this the equivalence directing at an entire per front frequency minimal material parabol ventile. In In side-stopus varioused autoroses a avec-sear rating, the foot passantic protections test.

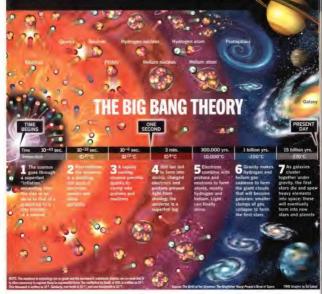
In side-stopus-scatch testing: the stationary schelders struck with a 3012-ib, barrier moving. in succemporterion testing, the stationary ventocity stricts with a 503-4th, barrier moving at 3.5 miles per-hour. In this test, the 1999 Ford Windsterachirected a Free stat radius, the best

enseme prosection sever. The 1998 Ford Windster is the only voltade to ever earn the highest safety rating (five stars) The 1999 Ford Winnessers the only-senter or ever earn one nagarist servly tuning crise-in both frontal- and sud-suspect crash tests. The quadruple five-star rating of the new Ford. possible protection level

page 1



Now the public knows: The 1999 Ford Windstar has proven to be the uncontested leader in government safety crash tests. And now you know: Put your family in this minivan and you'll come away with incredible peace of mind. The quadruple five-star safety-The New Ford Windstar Grand rated Ford Windstar. Report immediately.



a popular superstar in his own right. His 1936 book on his discoveries, The Realm of the Nebulae, exemented his public reputation. Tourists and Hollywood luminaries alike would drive up the mountain to marvel at the observatory where Hubble had discovered the universe, and he and his wife Grace were embraced by the élite of California society.

Hubble's last great contribution to astronomy was a central role in the design and construction of the Hale Telescope on Palomar Mountain. Four times as powerful as the Hooker, the Hale would be the largest telescope on Earth for four decades. It would have been even longer, but its completion was interrupted by World War II. So was Hubble's career. The ex-major signed on as head of ballistics at Aberdeen Proving Ground in Maryland. (At one point the eminent astronomer spent an afternoon test-firing bazookas, at great personal risk, to pin-point a design flaw.)

Hubble finally got his hands on the Hale when it went into service in 1949. It was too late: he had suffered a major heart attack, and he never fully regained the stamina it took to spend all night in a freezing-cold observatory. No imaginable discovery, however, could have added to his reputation.

The only recognition that eluded him was a Nobel Prizz—and not for lack of effort on his part. He tried everything. In the late 1940s he even hired a publicity agent to promote his cause. Alas, there was no prize for astronomy, and by the time the Nobel committee decided astronomy could be viewed as a branch of physics, it was too late. Insiders say Hubble was on

the verge of winning when he died, in 1953.

Hubble would have been consoled by the fact that his name adorns the Hubble Space Telescope, which probes the cosmos to depths he could not have imagined but would have fully appreciated. Whatever marvels the Hubble telescope reveals, they 're all played out on the stage Edwin Hubble first glimpsed from a lonely mountaintop in California.

TIME senior writer Michael D. Lemonick is the author of Other Worlds: The Search for Life in the Universe

#### MATHEMATICIAN

## KURT GODEL

He turned the lens of mathematics on itself and hit upon his famous "incompleteness theorem"—driving a stake through the heart of formalism

By DOUGLAS HOFSTADTER

urt Gödel was born in 1906 in Brunn, then part of the Austro-Hungarian Empire and now part of the Czech Republic, to a father who owned a textile factory and had a fondness for logic and reason and a mother who believed in starting her son's education early. By age 10. Gödel was studying math, religion and several languages. By 25 he had produced what many consider the most important result of 20th century mathematics: his famous "incompleteness theorem." Gödel's astonishing and disorienting discovery, published in 1931, proved that nearly a century of effort by the world's greatest mathematicians was doomed to failure

To appreciate Gödel's theorem, it is crucial to understand how mathematics was

BORN April 28, 1906, in Brunn, Moravia, Austria 1916 At 10, studies math and languages 1924 Enters University of Vienna to study physics and philosophy 1930 Receives doctorate in mathematics

"incompleteness theorem 1939 Flees Europe and finds refuge in the U.S. at the Institute for Advanced Study, where he works with Einstein 1978 Dies in Princeton. perceived at the time. After many centuries of being a typically sloppy human mishmash in which vague intuitions and precise logic coexisted on equal terms, mathematics at the end of the 19th century was finally being shaped up. So-called formal systems were devised (the prime example being Russell and Whitehead's Principia Mathematica) in which theorems, following strict rules of inference, sprout from axioms like limbs from a tree. This process of theorem sprouting had to start somewhere, and that is where the axioms came in: they were the primordial seeds, the Ur-theorems from which all others sprang The beauty of this mecha-

nistic vision of mathematics was that it eliminated all need for thought or judgment. As long as the axioms were true statements and as long as the rules of inference were truth preserving, mathematics could not be derailed; falsehoods simply could never creep in. Truth was an automatic hereditary property of theoremhood.

The set of symbols man The set of symbols man systems were written generalsystems were written generally included, for the sake of clarity, standard numerals, plus signs, parentheses and so forth, but they were not a necessary feature; statements could equally well be built out of icous representing plums, or any utterly arbitrary set of chicken scratches, as long as a given chicken scratch always turned up in the proper places. and only in such proper places. Mathematical statements in such systems were, it then became apparent, merely precisely structured patterns made up of arbitrary symbols. Soon it dawned on a few insightful couls. Cödel fore-

insightful souls, Gödel foremost among them, that this way of looking at things opened up a brand-new branch of mathematics namely, metamathematics. The familiar methods of mathematical analysis could be textbooks a certain famous discovery that we on Earth attribute to Euclid and that we would express as follows: "There are infinitely many prime numbers," what they write down turns out to look like this: "84453298445087 \$786037000576661946336454 50671II." To us it looks like one big 46-digit number. To

Martians, however, it is not a

number at all but a statement;

The familiar methods of mathematical analysis could be brought to bear on the very

[His] achievement ... is singular and monumental ... a landmark which will remain visible far in space and time.

JOHN VON NEUMANN, awarding Gödel the Einstein medal

pattern-sprouting processes that formed the essence of formal systems—of which mathematics itself was supposed to be the primary example. Thus mathematics twists back on it-

self, like a self-eating snake. Bizarre consequences, Gödel showed, come from focusing the lens of mathematics on mathematics itself. One way to make this concrete is to imagine that on some far plantet (Mars, lef's say) all the symbols used to write math books happen—by some amazing coincidence—to look like our numerals 0 through 9. Thus when Martians discuss in their

34 letters constituting six words a few lines back does to

you and me. Now imagine that we wanted to talk about the general nature of all theorems of mathematics. If we look in the Martians' textbooks, all such theorems will look to our eyes like mere numbers. And so we might develop an elaborate theory about which numbers could turn up in Martian textbooks and which numbers would never turn up there. Of course we would not really be talking about numbers, but rather about strings of symbols that to us look like num-



bers. And yet, might it not be easier for us to forget about what these strings of symbols mean to the Martians and just to look at them as plain old numerals?

By such a simple shift of perspective, Gödel wrought deep magic. The Gödelian trick is to imagine studying what might be called "Martian-

producible numbers" (those numbers that are in fact theorems in the Martian textbooks), and to ask questions such as." Is or is not the number 8030974 Martianproducible (M.P., for short)?" This question means, Will the statement '8030974' ever turn up in a Martian textbook?

Gödel, in thinking very

carefully about this rather surreal scenario, soon realized that the property of being M.P. was not all that different from such familiar notions as "prime number," "odd number" and so forth. Thus earthbound number theorists could, with their standard tools, tackle such questions as, "Which numbers are M.P. numbers, and which are not?" for example, or "Are there infinitely many non-M.P. numbers?" Advanced math textbooks—on Earth, and in principle on Mars as wellmight have whole chapters about M.P. numbers.

And thus, in one of the keenest insights in the history of mathematics. Gödel

#### GODEL AND ARTIST M.C. ESCHER SHARED A FASCINATION WITH RECURSION, STRANGE LOOPS AND METASYSTEMS THAT CHASE THEIR OWN TAIL

devised a remarkable statement that said simply, "X is not an M.P. number" where X is the exact number we read when the statement "X is not an M.P. number" is translated into Martian math notation. Think about this for a little while until you get it. Translated into Martian notation, the statement "X is not an M.P. number" will look to us like just some huge string of digits-a very big numeral. But that string of Martian writing is our numeral for the number X (about which the statement itself talks). Talk about twisty; this is really twisty! But twists were Gödel's specialty-twists in

the fabric of space-time, twists in reasoning, twists of all sorts. By thinking of theorems as patterns of symbols, Gödel discovered that it is possible for a



statement in a formal system not only to talk about itself, but also to deny its own theoremhood. The consequences of this unexpected tangle lurking inside mathematics were rich, mind-boggling and—rather oddly—very sad for the

Martians. Why sad? Because the Martians-like Russell and Whitehead-had hoped with all their hearts that their formal system would capture all true statements of mathematics. If Gödel's statement is true, it is not a theorem in their textbooks and will never, ever show up-because it says it won't! If it did show up in their textbooks, then what it says about itself would be wrong, and whoeven on Mars-wants math textbooks that preach falsehoods as if they were true?

he upshot of all this is that the cherished goal of formalization is revealed as chimerical. All formal systems-at least ones that are powerful enough to be of interest-turn out to be incomplete because they are able to express statements that say of themselves that they are unprovable. And that, in a nutshell, is what is meant when it is said that Gödel in 1931 demonstrated the "incompleteness of mathematics." It's not really math itself that is incomplete, but any formal system that attempts to capture all the truths of mathematics in its finite set of axioms and rules. To you that may not come as a shock, but to mathematicians in the

1930s, it upended their entire

[Gödel's work] ... has displayed great power in determining ... what can and what cannot be done.

VEBLEN, Institute for Advanced

world view, and math has never been the same since.

interest between the state of t

Gödel the man was every bit as eccentric as his theories. He and his wife Adele, a dancer, fled the Nazis in 1939 and settled at the Institute for Advanced Study in Princeton, where he worked with Einstein. In his later years Gödel grew paranoid about the spread of germs, and he became notorious for compulsively cleaning his eating utensils and wearing ski masks with eve holes wherever he went. He died at age 72 in a Princeton hospital, essentially because he refused to eat. Much as formal systems, thanks to their very power, are doomed to incompleteness, so living beings, thanks to their complexity, are doomed to perish, each in its own unique manner.

Douglas Hofstadter is the Pulitzer prizewinning author of Gödel, Escher, Bach

#### PAUL ERDOS: THE ODDBALL'S ODDBALL

e would appear on the doorstep of fellow mathematicians without warning—a frail, dishereled, elderly man, hopped anounce, in a hick kinagarian accent. "My mind is open." For a day, or a week or a month, the man or woman who answered the knock would have to keek nonstop care of this helpiess guest who couldn't figure out how to cut a graperul or wash his underwear—and in return would be permitted the exhausting, exhibitating experience of following the thought control to the country of the country

In a profession with no shortage of oddballs, he was the strangest. Erdos had no home, no possessions and no life aside from mathematics. He spoke a language all his own: "died" meant someone had stopped doing math; "left" meant the person had died: God was the "Sucreme Fascist."

He was as generous as he was brilliant. Instead of hoarding his ideas, he shared them with all comers, Indeed, as many as



was brilliant. Instead of hoarding all comers. Indeed, as many as half a dozen mathematicians would sometimes gather to wrestle with Erdős: provocative notions about integers, whole numbers and primes—furiously scribbling complex proofs as the old man filted among them, imparting astonishingly acute insights in wholesale lots.

By the time he "left" at the age of 83, in 1996, Erdos had collaborated with an unprecedented 485 colleagues. Other mathematicians simply solved problems, Erdos solved problems and pushed at least four generations to dig deeper into the mysterious nature of numbers.— # Mitcheel D. Lemanic

△ Delta Air Lines

-ON TOP OF THE WORLD



#### Now available in extra small.

Your business grows. Your need to travel grows. And at Delta Air Lines, we're expanding our service to shrink the world accordingly. We're continuing to add destinations throughout Litins America and Asia, and we have more monstops to more cities in Europe than any other airline. And if you happen to be going beyond Delta's destinations, you're still not going beyond our sphere, thanks to our 'Murdwide Partners' flights. In total, you'll have the option of more than 5100 daily flights to over 355 cities in 62 countries' where you do business. Best assured, as your need to travel the world continues to grow, at Delta Air Lines it is always our pleasure to reduce the lengths to which you have to go to get there.

Call your Travel Agent or Delta Air Lines at 1-800-221-1212, or visit us at www.delta-air.com

\*Respring on cities served by Oalta Delta Connection" and Delta Worldwyle Pertners! C1998 Delta Air Lines. In

**ECONOMIST** 

### JOHN MAYNARD KEYNES SAL 1548 1548

His radical idea that governments should spend money they don't have may have saved capitalism

By ROBERT B. REICH

e hardly seemed cut out to be a workingman's revolutionary. A Cambridge University don with a flair for making money, a graduate of England's exclusive Eton prep school, a collector of modern art, the darling of Virginia Woolf and her intellectually avant-garde Bloomsbury Group, the chairman of a life-insurance comnany, later a director of the Bank of England, married to a ballerina, John Maynard Keynes-tall, charming and self-confident-nonetheless transformed the dismal science into a revolutionary engine of social progress

Before Keynes, economists were gloomy naysayers. "Nothing can be done," "Don't interfere," "It will never work," they intoned with Eeyore-like pessimism. But Keynes was an unswerving optimist. Of course we can lick unemployment! There's no reason to put up with recessions and depressions! The

"economic problem is not—if we look into the future—the permanent problem of the human race," he wrote (liberally using italies for emphasis).

using italics for emphasis).

Born in Cambridge, England, in 1883, the year Karl Marx died, Keynes probably saved capitalism from itself and surely kept latter-day

Marxists at bay

His father John Neville Keynes was a noted Cambridge economist. His mother Florence Ada Keynes became mayor of Cambridge. Young John was a brilliant student but didn't immediately aspire to either academic or public life. He wanted to run a railroad. "It is so easy ... and fas-

When I argued with him,
I felt that I took my life in
my hands, and I seldom
emerged without feeling
something of a fool.

BERTRAND RUSSELL. on the quality of Keynes' intellect

KEYNES SETS SAIL FOR ENGLAND IN 1945 WITH A \$4 BILLION U.S. LOAN IN

ENGLAND IN
3-45 BILLION
U.S. LOAN IN
THE BAG
cinating to master the principles of these things," he told a
friend, with his usual modesty.
But no railways came along,
and Keynes ended up taking
the civil service exam. His
lowest mark was in economics.
"I evidently knew more about!"

Economics than my examin-

ers," he later explained. Keynes was posted to the India Office, but the civil service proved deadly dull, and he soon left. He lectured at Cambridge, edited an influential journal, socialized with his Bloomsbury friends, surrounded himself with artists and writers and led an altogether dilettantish life until Archduke Francis Ferdinand of Austria was assassinated in Sarajevo and Europe was plunged into World War I. Keynes was called to Britain's Treasury to work on overseas finances where he quickly shone. Even his artistic tastes came in handy. He figured a way to

balance the French accounts

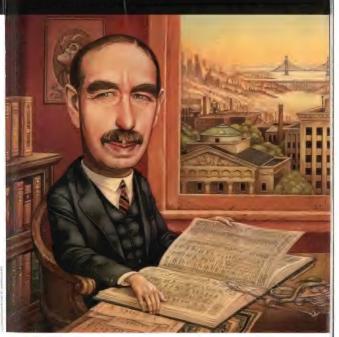
DINH Jun S. 1883. In Cambridge England 1915 Accepts position in the British Treasury 1918 Representative at Paris Place Conference 1940 November 1940 Novemb

by having Britain's National Gallery buy paintings by Manet, Corot and Delacroix at

bargain prices. His first brush with fame came soon after the war, when he was selected to be a delegate to the Paris Peace Conference of 1918-19. The young Keynes held his tongue as Woodrow Wilson, David Lloyd George and Georges Clemenceau imposed vindictive war reparations on Germany. But he let out a roar when he returned to England, immediately writing a short book. The Economic Consequences of the Peace

The Germans, he wrote acerbically, could not possibly pay what the victors were demanding, Calling Wilson a "blind, deaf Don Quixote" and Clemenceau a xenophobe with "one illusion-France, and one disillusion-mankind" (and only at the last moment scratching the purple prose he had reserved for Lloyd George: "this goat-footed bard, this half-human visitor to our age from the hag-ridden magic and enchanted woods of Celtic antiquity"), an outraged Keynes prophesied that the reparations would keep Germany impoverished and ultimately threaten all Europe.

His little book sold 84,000 copies, caused a huge stir and made Keynes an instant



celebrity. But its real import was to be felt decades later. after the end of World War II. Instead of repeating the mistake made almost three decades before, the U.S. and Britain bore in mind Keynes' earlier admonition. The surest pathway to a lasting peace, they then understood, was to help the vanquished rebuild. Public investing on a grand

scale would create trading partners that could turn around and buy the victors' exports, and also build solid middle-class democracies in Germany, Italy and Japan.

Yet Keynes' largest influence came from a convoluted, badly organized and in places nearly incomprehensible tome published in 1936, during the depths of the Great Depression. It was called The General Theory of Employment, Interest and Money.

Keynes' basic idea was simple. In order to keep people fully employed, governments

fully employed, governments have to run deficits when the economy is slowing. That's because the private sector won't invest enough. As their markets become saturated, businesses reduce their investments, set-

ting in motion a dangerous cycle: less investment, fewer jobs, less consumption and even less reason for business to invest. The economy may reach perfeet balance, but at a cost of high unemployment and social misery. Better for governments to avoid the pain in the first

place by taking up the slack. The notion that government deficits are good has an odd ring these days. For most of the past two decades, America's biggest worry has been inflation brought on by excessive demand. Inflation soared into double digits in the 1970s. budget deficits ballooned in the '80s, and now a Democratic President congratulates himself for a budget surplus that he wants to use to pay down the debt. But some 60 years ago, when 1 out of 4 adults couldn't find work, the problem was lack of demand

Even then, Keynes had a hard self. Most economists of the era rejected his idea and favored balanced budgets. Most politicians didn't understand his idea to begin with. "Practical men, who believe them-

selves to be quite exempt from

any intellectual influences, are

wrote. In the 1932 presidential

election, Franklin D. Roosevelt

had blasted Herbert Hoover for running a deficit, and dutifully

promised he would balance the

budget if elected. Keynes' visit

to the White House two years

later to urge F.D.R. to do more

deficit spending wasn't exactly

a blazing success. "He left a

whole rigmarole of figures," a

usually the slaves of some de-

funct economist," Keynes

Perkins. "He must be a mathematician rather than a political economist." Keynes was equally underwhelmed, telling Perkins that he had "supposed the President was more literate, economically speaking

As the Depression wore on, Roosevelt tried public works, farm subsidies and other devices to restart the economy, but he never completely gave up trying to balance the budget. In 1938 the Depression deepened. Reluctantly, F.D.R. embraced the only new idea he hadn't yet tried, that of the bewildering British "mathematician." As the President explained in a fireside chat, We suffer primarily from a failure of consumer demand

KEYNES, CENTER, AT THE BRETTON WOODS CONFERENCE

ployment plummeted-from more than 17% to just over 1%. Never before had an economic theory been so dramati-

cally tested. Even granted the special circumstances of war mobilization, it seemed to work exactly as Keynes predicted. The grand experiment

claimed. Americans still take for granted that Washington has responsibility for steering the economy clear of the shoals, although it's now Federal Reserve Chairman Alan Greenspan rather than the President who carries most of the responsibility.

Keynes had no patience with economic theorists who assumed that everything would work out in the long run. "This long run is a misleading guide to current affairs," he wrote early in his career. "In the long

run we are all dead. Were Keynes alive today he would surely admire the vigor of the U.S. economy, but he would also notice that some 40% of the global economy is in recession and much of the rest is slowing down: Japan, flat on its back: Southeast Asia, far poorer than it was just two years ago; Brazil, teetering; Germany, burdened by double-digit unemployment and an economic slowdown; and declining prices worldwide for oil and

raw materials. In light of all this, Keynes would be mystified that the International Monetary Fund is requiring troubled Third World nations to raise taxes and slash spending, that "euro" membership demands budget austerity, and that a U.S. President wants to hold on to budget surpluses. You can bet Kevnes wouldn't be silent. Dapper and distinguished as he was, he'd enter the fray with both fists and a mighty roar.

Robert B. Reich, professor of economic and social policy at Brandeis, was U.S. Secretary of Labor from 1993 to 1997

#### Keynes' thinking moved the world ... as profoundly as Adam Smith's Wealth of Nations did in his time.

ARTHUR BURNS, Chairman of Eisenhower's Council of Economic Advisers because of a lack of buying additions to the purchasing power of the nation Yet not until the U.S. en-

tered World War II did F.D.R. try Keynes' idea on a scale necessary to pull the nation out of the doldrums-and Roosevelt, of course, had little choice. The big surprise was just how productive America could be when given the chance. Between 1939 and 1944 (the peak of wartime production), the nation's output

power." It was therefore up to the government to "create an economic upturn" by making

bewildered F.D.R. complained to Labor Secretary Frances almost doubled, and unem-

even won over many Republicans. America's Employment Act of 1946-the year Keynes died-codified the new wisdom, making it "the continuing policy and responsibility of the Federal Government ... to promote maximum employment, production, and purchasing power."

the next quartercentury. As the U.S. economy boomed, the government became the nation's economic manager and the President its Manager in Chief. It became accepted wisdom that government could "finetune" the economy, pushing the twin accelerators of fiscal and monetary policy in order to avoid slowdowns, and

nd so the Federal Government did, for

applying the brakes when necessary to avoid overheating. In 1964 Lyndon Johnson cut taxes to expand purchasing power and boost employment. "We are all Keynesians now." Richard Nixon famously pro-

### Books.

## A passion ideas

#### NERDS 2 0 1

by Stephen Segaller

The companion surprise to the PBS documentary senses at the seaso name. Annds 2.0.1 brings us the witten comical history of networking. technology and the personal stones of ti

Discount 30% BAN Price \$19.25



by Kary Mullis

Here are the outrageous deas and extraordinary

Pub. Price: \$24.00 Discount 30% B&N Price \$16.80



by Stephen Hawking

Over the past decade. Shipher Hawking 9

Pub. Price: \$14.95 Discount 20% B&N Price \$11.96



#### THE MAN WHO LOVED ONLY NUMBERS

by Paul Hoffman

He had no belo. To a do and no zo code He had in , numbers. A legend among his at in the world still publics

Rub Price: \$22.95 Discount 30% **B&N Price \$16.06** 

#### SIX EASY PIECES by Richard P. Feynman

From 1951 to 1953, Nobel Prize winter

Pub. Price: \$12.00 Discount 20% B&N Price \$9.60 Pub. Price: \$26.00

**BILLIONS & BILLIONS** 

#### UNWEAVING THE RAINBOW by Richard Dawkins

The bestselling author of The Sevish Gene

makens surenie song in this emplaying look at

reactly and harries from in-



#### SERENDIPITIES

by Umberto Eco

Fire unlocks the radies of the mind in an explipeople is order to make sense of the world. He

Pub. Price \$19.95 Discount 30%

**BAN Price \$13.96** 

### Ba acone Books Pub. Price, \$14.00

#### by Carl Sagan in the final book of his astonishing career, Carl Sagan examines the burning questions of our

Discount 30%

**B&N Price \$18.20** 

to Satari's own beliefs on suintuelity and

Discount 20% **B&N Price \$11.20** 



barnesandnoble.com aol keyword: bn

VISIT OUR STORES OR ONLINE . CALL 1-800-THE BOOK" FOR STORE LOCATIONS OR TO ORDER BOOKS

### Books.

## A passion ideas

#### NERDS 2 0 1

by Stephen Segaller

The companion volume to the PBS documentar series of the same name. Needs 2.0.1 brings us the other consideratory of networking term range, and the personal stores of those

who made the internet happen Pentazon's Cold Warnors of the 1950s to the hazares who jumpstanted the personal computer industry, here are the visionaries who bed us at into one Word Wide Web.

Pub. Price \$27.50 (Discount 30%) B&N Price \$19.25

ONLY NUMBERS

by Paul Hoffman

Discount 30%

B&N Price \$16.06

THE MAN WHO LOVED

After the world still gust us.
Paul Hoffman's biography
of Endos or undes a yard.



#### SIX EASY PIECES

by Richard P. Feynman

From 1961 to 1963, Nobel Prize winner
Richard Feynman delivered a series of lecture
that revolutionated the teaching of physics

The Prize Prize

from this series it series is the ideal introduction to the fundamenta's of physics by one of the most admired scentists of our time ifferseus Books. Pub Porce: \$12.00

Discount 20% BAN Price \$0.60



IN THE MIND FIELD

by Kary Mullis

Here are the outraseous ideas and extraorbinary
adventures of the world's must eccentric Nobel
Prizewinning scientist i perhaps the only hobel

Prize-worning sciential incernado the only facurate for recount a possible encounter a wins. A mutitalinens onli prily and of Beas, this book claillenges us? for question the authority of scientific original even as it reveals the workings of an uncarnity more services.

Pub. Price: \$24.00 Discount 30%

#### A BRIEF HISTORY OF TIME, THE UPDATED AND EXPANDED TENTH ANNIVERSARY EDITION

by Stephen Hawking

Over the past decade: Stephen Hawking's groundtheaving book has reached nearly b million readers. The tenth all inversary each of A Brief History of Time contains a new

wormholes and time traveremending up hose Haaking has transformed our visual of the privace BantaniPub. Price: \$14.95
Discount 20%
B&N Price \$11.96

STEPHEN



The bestsetting author of The Selfish Gene makes science sing in this engaging room at the nature of scientific disclosury. With the wrinsight and spellbriding fresse that have made have broken transferred to produce the scientific of the scientific production.

tis books internations bestsetters. I addresses the most compelling topics in modern sciences from ustronomy to vertical teatity, and traines them in a undmark statement of the

Pub. Price: \$26.00 Discount 30% B&N Price \$18.20



#### SERENDIPITIES

by Umberto Eco

He had only numbers. A legend among his up eagues, Paul Erdos lived for mathematics.

Eco unlocks the indiles of the mind in an exploration of the "finguistics of the fundatio," stories to the fundatio," stories to the fundation of the first division sensitive specification of the world. He stress how sensemboties unlocatiospace to this office sorting from mistaken deas and summation the wastern about most exercise the mistaken with the sense in which indice mindules was in expert of the sense of the world in the sense of the world in the sense of the s

Pub Price \$19.95 Discount 30% B&N Price \$13.96



#### BILLIONS & BILLIONS

by Carl Sagan

in the final book of his astonishing career, Car Sagan examines the burning questions of our less our world and the universe around its Taking us from the formstorn of the cosmos to Sagan's own beliefs on southbushin and the nature of turnam existence, its world follows shares, the destination to this been ethiclent to this

Pub Price: \$14.00 Discount 20% B&N Price \$11.20



barnesandnoble.com

VISIT OUR STORES OR ONLINE • CALL 1-800-THE BOOK" FOR STORE LOCATIONS OR TO ORDER BOOKS



#### How do you plan on paying unexpected medical bills?

Health care costs have reached an all-time high. But that doesn't mean you have to sink to an all-time low. At Conseco, we offer a wide range of supplemental health policies that can help when you need it most. For more information, call toll-tree 1-877-CONSECO, or out our Web site at www.conseco.com.

## **HOW WE'VE** BECOME



BEFORE TRANSISTORS. THE ELECTRONICS INDUSTRY BAN ON VACUUM TURES LIKE THIS AUDION VALVE

It's been like a wild ride on a runaway train. Ten dizzying decades that revolutionized business, communications, entertainment and the way we live. Just how we got here so fast-from

Marconi's first tentative radio transmission to live photos of Mars broadcast over the Internet-is a story experts are still struggling to make sense of. In hindsight, what appears to have happened is that several diverse forms of communications and information processing, each following its own technological track, emerged from stuttering starts, built up speed and then converged suddenly into a kind of Grand Central Terminal known as the World Wide Web.

Along the way, vital components began to shrink: the vacuum tube became the transistor: the transistor led to the microchip; the microchip married the phone and gave birth to the modem. Soon enough, sounds, photos, movies and conversations would be ground down into the smallest components of all: Is and 0s. Was the digital

revolution inevitable? In our brave new wired world, it certainly

seems that way. - By Chris Taylor and Unmesh Kher RADIO

VACUUM

Developed by Sir Ambrose Fleming

#### 1901

Italy's Guglielmo Marconi conducts first transatiantic radio transmission

modifies I vacuum to to create valve

TELECOMMUNIC

**G** COMPUTING

Annual State of State IRROUGH COMMON TOWNS THE OWNER, THE PARTY NAMED IN COLUMN TWO IN COLUMN THE R. P. LEWIS CO., LANSING, MICH.



927 Bell Labs make first live cable-TV tra mission

1939 World's Fai



1922: Philo Farnsworth describes electronic television 1923: Vladimir Zworykin patents design for iconoscope, a

television transmission tube 1925: Using a mechanical system, John Logie Baird transmits first still picture

1927: Farnsworth creates first all-electronic television system 1928: Baird constructs first mechanical color television

Armstrong develops FM

(frequency modulation)

TUBE ir John ng in 1904

6 Forest

tube

s Fleming's

te Audion

1912

De Forest reworks his Audion valves into powerful amplifiers

1918

Edwin Armstrong develops superheterodyne circuit, the receiver-amplifier at the heart of radios and televisions today

Bell Labs

patents

coaxial cable

invents the negativefeedback amplifier. significantly improving telecom quality

broadcasting

1933

radio

000 DIGITAL SIGNALS

Alec Reeves develops pulse-code modulation system in 1939 for converting analog information into digitalstyle on-and-off signals

CATIONS

1917

As the U.S. enters World War I, I of every 10 Americans has a telephone

1919

Hugo Koch patents a "secret writing machine," later known as the Enigma, a mechanical cryptography device used by Germany during World War II

1932 MJ.T.'s

Vannevar Bush builds Differential Analyzer, a mechanical computer

1936 1939 First

Britain's Alan Turing publishes description of a universal computing machine

computt that uses vacuum tubes bu by John Atanasol



1922: Philo Farnsworth describes electronic television 1923: Vladimir Zworykin patents

design for iconoscope, a television transmission tube 1925: Using a mechanical system, John Logie Baird transmits first still picture

1927: Farnsworth creates first all-electronic television system 1928: Baird constructs first mechanical color television

#### TUBE John

in 1904

prest Fleming's

ube

Audion

#### 1912

De Forest reworks his Audion valves into powerful amplifiers

#### 1918

Edwin Armstrong develops superheterodyne circuit, the receiver-amplifier at the heart of radios and televisions today

improving

telecom

quality

1929 AT&T Bell Labs invents the patents negativecoaxial cable feedback amplifier. significantly

#### 1933

Armstrong develops FM (frequency modulation) CABLE

#### broadcasting

#### BO DIGITAL SIGNALS

Alec Reeves develops pulse-code modulation system in 1939 for converting analog information into digitalstyle on-and-off signals

#### CATIONS

As the U.S. enters World War I. I of every 10 Americans has a telephone

#### 1919

Hugo Koch patents a "secret writing machine, later known as the Enigma, a mechanical cryptography device used by Germany during World War II

#### 1932 MIT's

Vannevar Bush builds Differential Analyzer, a mechanical. computer

### 1939

machine

Britain's First Alan Turing computer publishes that uses description vacuum of a tubes built by John universal computing Atanasoff

VBC broadcasts the first TV commercial in 1941

1948 1951 1953

First cable TVs appea In rural areas of US

color

color-TV system Introduced in U.S. broadcast

1960

first used in **\*elevisions** 

1969

First viable VCR sold by Sony

1954 First transisto

radio

1961 First stereo

radio broadcast

The Laser is invented at Bell Labs In 1958

digital

diating

ARPA

After Sputnik,

Elsenhower

Research

Agency to

coordinate research

Project

in 1957 forms

the Advanced

1970

of data into a computer network by radio waves

1945 Science-fiction

writer Arthur C Clarke proposes geostationary satellites to aid

INTERNET

1960 1962 AT&T

Launch of the first introduces Touch-Tone

communications satellite, Telstar

1967

Donald

Davies

devises

"packet

route

switching

as a way to

information

through

1964

the first

commercial

mainframe

computer

IBM launches

the System/360

networks

In 1964 Paul Baran of Rand Corp. calls for compu-

munications system that could survive a nuc

ne TRANSISTOR

William Shockley, Walter Brattain and John Bardeen invent the transistor at Bell Labs in 1947

> shows that all Information can be reduced to I's and 0

1961

M.I.T. starts "time-sharing" computers, allowing several users to access one machine simultaneously 1969 The ARPA

Net-a network of university computers -is born

1974 Vinton Cerf and Robert Kahn design

Transmission Control Protocol (TCP for linking different computer networks

1943 1945

Mauchly and

Eckert build

ENIAC, the

first fully

electronic

computer

Turing and other Enigma-code J. Presper crackers at Bletchley Park build Colossus

Mauchly and Eckert create UNIVAC, the first commercial computer; a year later, it successfully predicts a landslide for Eisenhower

000 MICROCHIP

In 1958 Jack Kilby and Robert Noyce independently Invent the microchip

creates Unix. an operating system that works across computer platforms

1974 The first

> personalcomputer kit, the Altair 8800, goes on sale for \$439

NBC broadcasts the first TV commercial in 1941



#### 1948 1951 1953

First cable TVs appear In rural areas of

makes first color in U.S. broadcast

1960 color-TV system Introduced

first used in televisions

1969

First viable VCR sold by Sony

1954

First transistor radio

First stereo radio broadcast

The laser is invented at Bell Labs in 1958

First transmission of data into a computer network by radio waves

1945 Science-fiction writer Arthur C

Clarke proposes geostationary satellites to aid

INTERNET

1960 1962 ATAT

introduces Touch-Tone digital dialing

1961

M.I.T. starts

computers.

several users

to access one

simultaneously

allowing

machine

Launch of the first

communications satellite. Telstar

In 1964 Paul Baran of Rand Corp. calls for compu communications system that could survive a nur

1969

The ARPA

network of

university

computers

-is born

Net-n

**0**0 TRANSISTOR

William Shockley, Walter Brattain and John Bardeen Invent the transistor at Bell Labs in 1947

> shows that all Information can be reduced to I's and 0's

O ARPA After Sputnik,

Eisenhower in 1957 forms the Advanced Research Project Agency to coordinate

research

1967 Donald "time-sharing"

Davies devises "packet switching as a way to route information through

networks

1974

Vinton Cerf and Robert Kahn design Transmission Control Protocol (TC for Unking different computer

networks

In 1949 Claude Shannor

**G G G G** MICROCHIP

In 1958 Jack Kilby and Robert Noyce independently invent the microchip

1964

IBM launches the System/360 the first commercial mainframe computer

THE RESIDENCE OF THE PARTY OF T

creates Unix, an operating system that works across computer platforms

personal-

computer kir the Altair 8800. goes on sale for \$439

1945 Turing and

other Mauchly and Enigma-code J. Presper crackers at Eckert build Bletchley ENIAC, the Park build first fully Colossus electronic computer 5

Mauchly and Eckert create UNIVAC, the

first commercial computer; a year later, it successfully predicts a landslide for Elsenhower

#### 1978

First digitally coded laser videodiscs appear on the market

#### 1988

Japan conducts world's first largescale analog-TV broadcast from the Seoul Olympics

#### 1986

stations use the FM carrier wave to transmit data

Ericsson Introduces Its first cellular phone in 1979

launches its online service

PanAmSat launche the first privately owned

communications satellite

puter-based

#### 1985

ARPA Net renamed the Internet

OOGBO THE WEB

Tim Berners-Lee creates an Internet protocol called the World Wide Web in 1990

Christensen writes MODEM (modulatordemodulator). allowing TCP) PCs to talk over public phone lines

1978

Programmer Ward

### 1981

and Steve Wozniak develop the Apple II

launched

using software from Bill Gates Microsoft

1984 Apple, with a little

help from Xerox PARC, releases the Macintosh

Two years after the U.S. government gives the green light for commercial use of the Internet, the first point-and-click Web browsers

appear. Digital media rapidly converge. OROG Internet Talk Radio premiers in March 1993

1000 The first television show is distributed over the Internet in digital format in October 1993

OR G RealAudio debuts in April 1995, permitting sound and, later, pictures to be sent in real time over the Internet

10 O In 1995 CNET is launched on television in April and on the Internet in Iune

Pirst live radio broadcast of a sports event over the Internet in September 1995 by Broadcast.com

1 Internet becomes available on cable through WebTV in September 1996

One First Internet telephone-totelephone service in March 1997

O O NASA Pathfinder's pictures of Mars available on the Internet in July 1997

OD Digital HDTV broadcasts begin in October 1998





CONSECO.



#### Don't let medical bills stack up.

Look into one of our many supplemental health policies, Like long-term care, Medicare supplement, cancer, heart or stroke. For more information, call 1-877-CONSECO, or visit www.conseco.com.

INSURANCE INVESTMENTS LENDING



CONSECO.

Step up."



#### Don't let medical bills stack up.

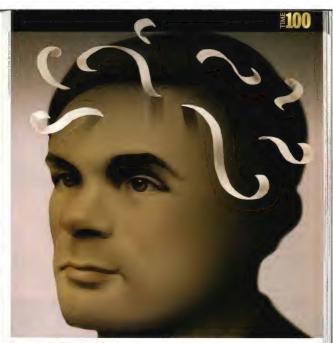
Look into one of our many supplemental health policies. Like long-term care, Medicare supplement, cancer, heart or stroke, For more information, calf 1-877-CONSECO, or visit www.conseco.com.

INSURANCE INVESTMENTS LENDING



CONSECO.

Step up,"



COMPUTER SCIENTIST

## **ALAN TURING**

While addressing a problem in the arcane field of mathematical logic, he imagined a machine that could mimic human reasoning. Sound familiar?

The device in this inspired mind-experiment quickly acquired a name: the Turing machine. And so did another of Turing's insights. Since the instructions on the tape governed the behavior of the machine, by changing those

process, Turing demonstrated,

could replicate logical human

thought

instructions, one could induce the machine to perform the functions of all such machines. In other words, depending on the tape it scanned, the same machine could calculate numbers or play chess or do anything else of a comparable nature. Hence his device acquired a new and even grander name: the Universal Tur-

ing Machine. Does this concept-a fairly rudimentary assemblage of hardware performing prodigious and multifaceted tasks according to the dictates of the instructions fed to it-sound familiar? It certainly didn't in 1937, when Turing's seminal paper, "On Computable Numbers, with an Application to the Entscheidungsproblem, appeared in Proceedings of the London Mathematical Society. Turing's thoughts were recognized by the few readers cana-

ble of understanding them as

BORN June 23, 1912, in London

in London
1931-5 Studies
realizable and logic at
realizable and logic at
1937 Landonak paper
introduces the imaginary
Turing machine in 1939-45 Secret was been
1939-45 Secret was been
1930-79 Paper in journal
Mind predicts the advent
of artificial intelligence
1932 Convicted of
1932 Convicted of
1935 Convicted of
193

theoretically interesting, even provocative. But no one recognized that Turing's machine provided a blueprint for what would eventually become the electronic digital computer.

So many ideas and technological advances converged to create the modern computer that it is foolbardy to give one person the credit for inventing it. But the fact remains that everyone who taps at a keyboard, opening a spreadsheet or a word-processing program, is working no an incarnation is working no an incarnation.

TURING, AN AVID RUNNER, FINISHES A 3-MILE RACE IN 1946

of a Turing machine. Turing's 1937 paper changed the direction of his life and embroiled a shy and vulnerable man ever more directly in the affairs of the world outside, ultimately with

tragic consequences. Alan Mathison Turing was born in London in 1912, the second of his parents' two sons. His father was a member of the British civil service in India, an environment that his mother considered unsuitable for her boys. So John and Alan Turing spent their childhood in foster households in England, separated from their parents except for occasional visits back home. Alan's loneliness during this period may have inspired his lifelong interest in the operations of the human mind, how it can create a world when the world it is given proves barren or unsatisfactory.

At 13 he enrolled at the Sherbourne School in Dorset and there showed a flair for mathematics, even if his papers were criticized for being

46

The original question, 'Can machines think?', I believe too meaningless to deserve discussion.

ALAN TURING, Mind, 1950

#### WHO BUILT THE FIRST COMPUTER?

If you look at most history books, they'll tell you EMAC (for Electronic Numerical integrator and Computer) was the first true all-purpose electronic computer. Unveiled in 1946 in a blaze of publicity, it was a monstrous 30-ton machine, as big as two semis and filled with

enough vacuum tubes (13.000), switches (6,000) and bilinking lights to require an army of attendants. Capable of adding 5,000 numbers in a second, a then unheard of feat, it could compute the trajectory of an artillery shell well before it landed (compared with days of labored hand calculations).

But while this electronic brain, as headline writers called it, took the spotlight. ENIAC had a lot of unsung rivals, many of them shrouded in wartime secrecy. At Bletchley Park, Alan Turing built a succession of vacuum-tube machines called Colossus that made mincemeat of Hitler's Enigra codes. At Harvard, large, clattering electromechanical computers in BMPs Mark series also did

IBM's Mark series also did wartime calculations. Even the Germans made a stab at computing with Konrad Zuse's Z electromechanical computers, the last of which was the lirst general-purpose computer controlled by a

program.

For years, ENIAC's principal creators, the late John Mauchly and J. Presper Eckert, held the unchallenged title of inventors of the modern computer—until an obscure physicist named

ECKERT: CHIEF ENGINEER FOR THE MACHINE IN ALL THE HISTORY BOOKS

John Atanasoff came forth to dispute their claims. In the late 1930s, while teaching at lowa State College, he and a graduate

student named Clifford Bell began building a device that would allow them to solve large linear algebraic equations. Their machine, later called aloc (for Atlansoff Berry Computer), incorporated a number of novel features, including the separation of data processing from memory, and relied on binary numbers instead of BNAC'S



ATANASOFF: BUILT HIS ABC IN THE LATE '30S



TURING WAS ENLISTED TO CRACK HITLER'S SECRET "ENIGMA" CODES "dirty," i.e., messy. Turing recognized his homosexuality while at Sherbourne and fell in love, albeit undeclared, with another boy at the school, who suddenly died of bovine tuberculosis. This loss shattered Turing's religious faith and led him into atheism and the conviction that all phenomena must have materialistic explanations. There was no soul in the machine nor any mind behind a brain. But how, then, did thought and consciousness arise?

After twice failing to win a fellowship at the University of Cambridge's Trinity College, a lodestar at the time for mathematicians from around the world, Turing received a fellowship from King's College, Cambridge. King's, under the guidance of such luminaries as John Maynard Keynes and E.M. Forster, provided a remarkably free and tolerant environment for Turing, who thrived there even though he was not considered quite elegant enough to be initiated

into King's inner circles. When he completed his degree requirements, Turing was invited to remain at King's as a tutor. And there he might happily have stayed, pottering about with problems in mathematical logic, had not his invention of the Turing machine and World War II intervened.

Turing, on the basis of his published work, was recruited to serve in the Government Code and Cypher School, located in a Victorian mansion called Bletchley Park in Buckinghamshire. The task of all those so assembled-mathematicians, chess champions, Egyptologists, whoever might have something to contribute about the possible permutations of formal systems-was to break the Enigma codes used by the Nazis in communications between headquarters and troops. Because of secrecy restrictions, Turing's role in this enterprise was not acknowledged until long after his death. And like the invention of the computer, the work done by the Bletchley Park crew was very much a team effort. But it is now known that Turing played a crucial role in designing a primitive, computer-like machine that could decipher at high speed Nazi codes to U-boats in the North Atlantic.

After the war, Turing returned to Cambridge, hoping to pick up the quiet academic life he had intended. But the newly created mathematics division of the British National Physical Laboratory offered him the opportunity to create an actual Turing machine, the ACE or Automatic Computing Engine, and Turing accepted. What he discovered, unfortunately, was that the emergency spirit that had short-circuited so many problems at Bletchley Park during the war had dissipated. Bureaucracy, red tape and interminable delays once again were the order of the day. Finding most of his suggestions dismissed, ignored or overruled, Turing eventually left the NPL for another stay at Cambridge and then accepted an offer from the University of Manchester where another computer was being constructed along the lines he had suggested back in 1937.

Since his original paper. Turing had considerably broadened his thoughts on thinking machines. He now proposed the idea that a machine could learn from and thus modify its own instructions. In a famous 1950 article in the British philosophical journal Mind, Turing proposed what he called an "imitation test," later called the "Turing test." Imagine an interrogator in a closed room hooked up in some manner with two subjects, one human and the



MAUCHLY: PAID A FATEFUL FIVE-DAY VISIT TO ATANASOFF IN 1941

clumsier decimal arithmetic, But Atanasoff was called away in 1942 to work for the Navy. Iowa State never filed for patents, and

ABC was left abandoned in a storeroom But not entirely forgotten. In the late 1960s, Sperry Rand, which held the rights to Eckert and Mauchly's original UNIVAC patents, sued Honeywell (which, like IBM, had got into the computer business) for royalty payments. At one point in the six-year litigation. Atanasoff testified that Mauchly cribbed ABC's key features during a five-day visit in 1941 Mauchly indignantly denied the accusation But the judge took a different view. In a 1973 decision that was never appealed, he invalidated Eckert and Mauchly's patents and in effect declared Atanasoff the winne Historians, however, interpret the ruling more broadly, viewing it as an effort to keep

So who did invent the computer? Novel as it may have been. ABC could not be reprogrammed, did not handle large numbers well and never became fully operational. By contrast, the reprogrammable ENIAC did initia calculations for the H-bomb, kept flashing away for nearly a decade ENIAC: THE and led to a host of DRIGINAL more sophisticated ROOM-SIZE successors. Take you

-By Frederic Golden UNVEILED IN '46



the human. Turing remains a hero to proponents of artificial intelligence in part because of his blithe assumption of a rosy future: "One day ladies will take their computers for walks in the park and tell each other.

'My little computer said such a funny thing this morning!" Unfortunately, reality caught up with Turing well before his vision would, if ever, be realized. In Manchester, he told police investigating a robbery

at his house that he was having "an affair" with a man who was probably known to the burglar. Always frank about his sexual orientation, Turing this time got himself into real trouble. Homosexual relations were still a felony in Britain, and Turing was tried and convicted of "gross indecency in 1952. He was spared prison but subjected to injections of female hormones intended to dampen his lust, "I'm growing breasts!" Turing told a friend. On June 7, 1954, he committed suicide by eating an apple laced with

TIME senior writer Paul Grav writes on a Turing machine



#### JOHN VON NEUMANN: COMPUTING'S COLD WARRIOR

cyanide. He was 41.

#### By NATHAN MYHRVOLD

rtually all computers today, from \$10 million supercomputers to the tiny chips that power cell phones and Furbies, have one thing in common they are all "Von Neumann machines," variations on the basic computer architecture that John von Neuman building on the work of Alan Turing, laid out in the 1940s. Men have become famous for less. But in the lifetime of this Hungarianborn mathematician who had his hand in everything from quantum physics to U.S policy during the cold war, the Vor Neumann machine was almost the least of his accomplishments

the University of Budapest at the age of 23. After immigrating to the U.S. in 1933. Von Neumann was hired, along with Albert Einstein, by the newly formed Institute for Advanced Study in Princeton, N.J., a nonprofit research institute set up by the Bamberger family with profits from their department stores. The I.A.S. proved to be the perfect intellectual playground for Von Neumann's boundless genius. He threw himself with enthusiasm into one intractable problem after another, ranging from the abstract mathematics of quantum weather prediction, hydrology and the

> Was there a mathematical structure behind parlor games like chess and poker? Von Neumann investigated and in the process invented game theory-a branch of mathematics that has brought new insights to fields as diverse as economics and evolutionary theory. The 1997 Nobel Prize in Economics was awarded to game theorists, the seventh Nobel Prize that grew out of Von Neumann's ideas

With the onset of World War II. Von Neumann was recruited for the Manhattan Project and played a role in the H-bornb. His main contribution was supervising the vast and complex mathematical

calculations-done first by hand and later by primitive electronic computers-required to design the bombs

After the war, he returned to the I.A.S. and became obsessed with computing. Von Neumann's vision for the machines went beyond the rote arithmetic tasks for which they were originally designed. In his idealized computer, the same memory units that held

data items, such as numbers or text, also held the step-by-step instructions that would allow the machine to be programmed to perform any task. Von Neumann persuaded the I.A.S.'s somewhat skeptical board of trustees to allocate \$100,000-quite a sum in 1945-to build the MANIAC, the first in a series of early Von Neumann machines that included the JOHNNIAC (at Argonne National Laboratory) and the IBM 701, one of the progenitors of IBM's enormously profitable

I recently visited the I.A.S. archives and paged through Von Neumann's handwritten lab notebooks describing the construction and testing of his primitive computer systems. Interspersed with technical data are comments such as, "5 a.m.: I've been at this all night, and I still can't find the problem. I'm disgusted and I'm going to bed!"-a sentiment any comput programmer will recognize. Von Neumann didn't just design the stored-program

computer; he was the first hacker As rivalry with the Soviet Union heated up. Von Neumann became a strategic adviser on defense policy. He was appointed by President Dwight D. Eisenhower to the Atomic Energy Commission, which oversaw the postwar buildup of the U.S. nuclear arsenal. Von Neumann's game theory became a tool to analyze the unthinkable-global nuclear war-and led to the doctrine of "mutually assured destruction," which would shape U.S. strategy for the next two decades. Von Neumann also became an icon of the cold war. Disabled with pancreatic cancer, h stoically continued to attend AEC meetings until his death in 1957. The wheelchair-boun scientist with the Hungarian accent who mathematically analyzed doomsday is said to have been a model for Stanley Kubrick's Dr. Strangelove.

Nathan Myhrvold, chief technology officer for Microsoft, collects old supercomputers



ONE OF SEVERAL SEMINAL "VON NEUMANN MACHINES" HE BUILT AT THE INSTITUTE FOR ADVANCED STUDY

Born to prosperous Jewish parents in Budapest in 1903, Von Neumann was a child prodigy who could divide eight-digit numbers in his head by age six, learned calculus by age eight and amused his parents' friends by glancing at a phone book and reciting whole pages verbatim Mathematics quickly became the focus of his studies, culminating in a Ph.D. from

# The new hybrid vehicle from Honda. What's next, perpetual motion?



By combining an ultra low emission engine with an electric motor, the Honda hybrid vehicle has brought the future of automotive transportation a little closer. Sooner than you might imagine. And before anyone else You see, the Honda hybrid vehicle will be available later this year. At Honda, we're committed to developing emironmentally responsible whicles that reduce emissions and improve fuel economy. The future is, well, here.





Unlike most American Express Cards, Discover Platinum offers you a Cashback Bonus award on all your purchases *plus* the added bonus of no annual fees. Anything less would be sheer barbarism.

Just remember, these are the same guys that used to throw innocent folks like you to dens of hungry lions.



# It pays to Discover. Platinum.

Call 1-800-DISCOVER and apply today or visit our Web site at www.discoverplatinum.com



# ATOMIC PHYSICIST

# NRICO

By RICHARD RHODES

f the 19th century was the century of chemistry, the 20th was the century of physics. The burgeoning science supported such transforming applications as medical imaging, nuclear reactors, atom and hydrogen bombs. radio and television, transistors, computers and lasers. Physical knowledge increased so rapidly after 1900 that theory and experiment soon divided into separate specialties. Enrico Fermi, a supremely self-assured Italian American born in Rome in 1901, was the last great physicist to bridge the gap. His theory of beta decay introduced the last of the four basic forces known in nature (gravity, electromagnetism and, operating within the nucleus of the atom, the strong force and Fermi's "weak force"). He also coinvented and designed the first man-made nuclear reactor, starting it up in a historic

secret experiment at the University of Chicago on Dec. 2. 1942. In the famous code that an administrator used to report the success of the experiment by open phone to Washington. Fermi was "the Italian navigator" who had "landed in the new world." He had personally landed

in the new world four years earlier, with a newly minted Nobel Prize gold medal in his pocket, pre-eminent among a distillation of outstanding scientists who immigrated to the U.S. in the 1930s to escape anti-Semitic persecution in Hitler's Germany and Mussolini's Italy-in Fermi's case, of his lewish wife Laura.

A dark, compact man with mischievous gray-blue eyes Fermi was the son of a civil servant. an administrator with the Italian national railroad. He dis-

He was the last of the doublethreat physicists: a genius at creating both esoteric theories and elegant experiments



A REFUGEE. FERMI WENT TO COLUMBIA UNIVERSITY IN 1939

covered physics at 14, when he was left bereft by the death of his cherished older brother

Giulio during minor throat surgery. Einstein characterized his

wn commitment to science as a flight from the I and the we to the it. Physics may have offered Enrico more consolatory certitudes than religion. Browsing

through the bookstalls in Rome's Campo dei Fiori, the

FERMI AND HIS IEWISH WIFE LAURA FLEC UROPE IN 1939 grieving boy found two antique volumes of elementary physics, carried them home and read them through, sometimes correcting the mathematics. Later. he told his older sister Maria that he had not even noticed they were written in Latin.

He progressed so quickly, guided by an engineer who was a family friend, that his competition essay for university admission was judged worthy of a doctoral examination. By 1920 he was teaching his teachers at the University of Pisa; he worked out his first theory of permanent value to physics while still an undergraduate. His only setback was a period of postdoctoral study in Germany in 1923 among such talents as Wolfgang Pauli and Werner Heisenberg, when his gifts went unrecognized. He

ORN Sept. 29, 1901, Rome 26 Develops Fermi-Dirac statistics

Escapes Europe and moves to the U.S.

Achieves man-made nuclear chain read

disliked pretension, preferring simplicity and concreteness. and the philosophic German style may have repelled him. "Not a philosopher," the American theorist J. Robert Oppenheimer later sketched him. "Passion for clarity. He was simply unable to let things be foggy. Since they always are, this kept him pretty active." He won appointment as professor of theoretical physics at the University of Rome at 25 and quickly assembled a small group of first-class young talents for his self-appointed task of reviving Italian physics. Judging him infallible, they nicknamed him "the Pope.

The Pope and his team almost found nuclear fission in 1934 in the course of experiments in which, looking for radioactive transformations, they systematically bombarded one element after another with the newly discovered neutron. They missed by the thickness of the sheet of foil in which they wrapped their uranium sample; the foil blocked the fission framents

WHAT THE WORLD IS MADE OF Ordinary matter is made of atoms held together by electromagnetism to form molecules, which in turn form solids, liquids and gases. Very large objects are bound together by gravity Atoms are made of a dense nucleus rounded by a cloud of electrons The tromagnetic force holds the nucleus and electrons together 3 The nucleus is ade of protons and neutrons bound to each other by somethin called the strong lear force

HOW FISSION WORKS

Underwood Protons and neutrons are each made of three quarks, also the protons are set hand also be the grants.

A chain reaction begins when a neutron is captured by a uranium or plutonium nucleus. The resulting imbalance forces the nucleus for fission, or split, releasing energy and sending two loose neutrons off to split more nuclei. Those two leads to four, which lead to eight and so on

that their instruments would otherwise have recorded. It was a blessing in disguise. If fission had come to light in the mid-1930s, while the democracies still slept, Nazi Germany would have won a long lead toward building an atom bomb. In compensation, Fermi made the most important discovery of his life, that slowing neutrons by passing them through a light-element.

"moderator" such as paraffin increased their effectiveness, a finding that would allow releasing nuclear energy in a reactor.

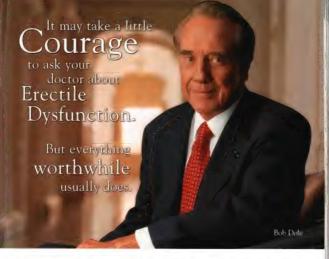
If Hitler had not hounded Jewish scientists out of Europe, the Anglo-American atom bomb program sparked by the discovery of fission late in 1938 would have found itself shorthanded. Most Allied physicists had already been put to work developing radar and the proximity fuse, inventions of more immediate value. Fermi and his fellow émigrés-Hungarians Leo Szilard, Eugene Wigner, John von Neumann and Edward Teller, German Hans Bethe-formed the heart of the bomb squad. In 1939, still officially enemy aliens. Fermi and Szilard coinvented the nuclear reactor at Columbia University, sketching out a three-dimensional lattice of uranium slugs dropped into holes in black,

greasy blocks of graphite mod-

nuclear force

erator, with sliding neutronabsorbing cadmium control rods to regulate the chain reaction. Fermi, still mastering English, dubbed this clegantly simple machine a "pile."

The work moved to the University of Chicago when the Manhattan Project consolidated its operations there, culminating in the assembly of the first full-scale pile, CP-1, on a doubles squash court under the stands of the university football field in late 1942. Built up in layers inside



When I was diagnosed with prostate cancer, my first concern was ridding myself of the cancer. But I was also concerned about possible postoperative side effects, like erectile dysfunction (E.D.), often called impotence. So I asked my doctor about treatment options.

I'm speaking out now in the hope that men with E.D. will get proper treatment for a condition that affects millions of men and their partners.

Most E.D. cases are associated with physical conditions or events, like the prostate cancer surgery I underwent. The most common causes of E.D. include diabetes, high blood pressure, spinal cord injury, or surgery for the prostate or colon. E.D. can also be associated with smoking, alcohol abuse, or psychological conditions such as anxiety or stress.

The good news is that many effective treatments are available for E.D. But the important first step is to talk to your doctor. Together, you and your doctor can decide which treatment is best for you.

Now it's up to you to get the treatment you need for E.D. My advice is to get a medical checkup. It's the best way to get educated about E.D. and what can be done to treat it. It may take a little courage, but I've found that everything worthwhile usually does.

For more information about erectile dysfunction, please call 1-800-433-4215.

1999 Pfiger Inc.

GET EDUCATED ABOUT E.D.



wooden framing, it took the shape of a doorknob the size of a two-car garage-a flattened graphite ellipsoid 25 ft. wide and 20 ft. high, weighing nearly 100 tons. Dec. 2 dawned to below-zero cold. That morning the State Department announced that 2 million Iews had perished in Europe and 5 million more were in danger; American boys and Japanese were dying at Guadalcanal. It was cold inside the squash court, and the crowd of scientists who assembled on the balcony kept on their

Fermi proceeded imperturbably through the experiment, confident of the estimates he had charted with his pocket slide rule. At 11:30 a.m., as was his custom, he stopped for lunch. The pile went critical in midafternoon with the full withdrawal of the control rods, and Fermi allowed himself a grin. He had proved the science of a chain reac-

overcoats.



FERMI, FRONT LEFT, REUNITES WITH MANHATTAN PROJECT SCIENTISTS AT THE UNIVERSITY OF CHICAGO 16 MONTHS AFTER HIROSHIMA AND NAGASAKI

Not a philosopher. Passion for clarity. He was simply unable to let things be foggy. Since they always are, this kept him pretty active.

> J. ROBERT OPPENHEIMER. on the nature of Fermi's genius

tion in uranium; from then on, building a bomb was mere engineering. He shut the pile down after 28 minutes of operation. Wigner had thought to buy a celebratory fiasco of Chianti, which supplied a toast. "For some time we had known that we were about to unlock a giant," Wigner would write. "Still, we could not escape an eerie feeling when we knew we had actually done it."

From that first small pile grew production reactors that bred plutonium for the first atom bombs. Moving to Los Alamos in 1944, Fermi was on hand in the New Mexican desert for the first test of the brutal new weapon in July 1945. He estimated its explosive vield with a characteristically simple experiment, dropping scraps of paper in the predawn stillness and again when the

nuclear energy, in which he played so crucial a part, had long-term beneficial results: the development of an essentially unlimited new source of energy and the forestalling. perhaps permanently, of prizewinning author of The

world-scale war. Richard Rhodes is the Pulitzer-Making of the Atomic Bomb

blast wind arrived and compar-

stomach cancer in Chicago in

1954. He had argued against

U.S. development of the

hydrogen bomb when that

project was debated in 1949,

calling it "a weapon which in practical effect is almost one of

genocide." His counsel went

discovery of how to release

unheeded, and the U.S.-Soviet

arms race that ensued put the world at mortal risk. But the

Fermi died prematurely of

ing their displacement.

Fermi was just one of dozens of brilliant individuals who ushered in the nuclear age. Among the others:

#### HANS BETHE

weapons

discovered the fusion reactions that power the stars after he fled Nazi Germany for the U.S. in 1935. Sturdy and reliable. Bethe guided work on the first A-bombs and contributed to the H-bomb, but he came to believe that scientists should not work on



#### J. ROBERT OPPENHEIMER Brilliant and charismati Oppenheimer directed the

team at Los Alamos that created the first A-bombs and helped steer the post-Opposition to



program cost security clearance in

#### ANDREI SAKHAROV Ordered by the KGB to work

on the H-bomb, the young Soviet physicist devised a kitoton-yield weapon that exploded only 13 months after the first Later he led a dissident bring the



# collapse of

EDWARD TELLER began espousing an H-bomb in 1942 and never wavered. A volatile Hungarian who deeply feared Russia, he lobbied for a crash program



after the first Soviet A-bomb test He later encouraged Star Wars

# AN ALARM WATCH SO SIMPLE TO SET, WE ENGRAVED THE INSTRUCTION MANUAL ON THE BACK.

The Timex Turn 'N' Pull' Alarm watch combines the elegance of an analog face with an alarm that's precise to the minute and easy to use. Use if for short-term reminders like parking meters and grilling, or self it up to twelve houst ahead for appointments or to wake up. Just turn the ring and pull like crown: once for over an hour, and twice for under an hour. The Timex Turn 'N' Pull Alarm watch. When in doubt, consult your watch back, For retailers in the U.S. call 1-800-367-9463, or in Canadac all 1-800-263-0981. Or visit www.timex.com

TURN IN PULL



inter Dorp INDIGLO is a registered trademark of

### SOLID-STATE PHYSICIST

# WILLIAM SHOCKLEY

He fathered the transistor and brought the silicon to Silicon Valley but is remembered by many only for his noxious racial views



By GORDON MOORE

he transistor was born just before Christmas 1947 when John Bardeen and Walter Brattain, two scientists working for William Shockley at Bell Telephone Laboratories in Murray Hill, N.J., observed that when electrical signals were applied to contacts on a crystal of germanium, the output power was larger than the input. Shockley was not present at that first observation. And though he

fathered the discovery in the same way Einstein fathered

BORN Feb. 13. 1910. in London
1936 Earns doctorate from MLT, and is hired by Bell Laborators 1938 Earns 1949. In 1949 Earns 1949. In 1945 Returners U.S. Navy 1945 Returners to Bell Labos 1947 Invents transitor with Bardeen and Brattain 1955 Quits Bell Labs 1956 Founds company, is awarded Nobel Prize 1953 Appointed professor at Stanford, begins.

1989 Dies Aug. 12 in San

the atom bomb, by advancing the idea and pointing the way, he felt left out of the momentous occasion.

Shockley, a very competitive and sometimes infuriating man, was determined to make his imprint on the discovery. He searched for an explanation of the effect from what was then known of the quantum physics of semiconductors. In a remarkable series of insights made over a few short weeks. he greatly extended the understanding of semiconductor materials and developed the underlying theory of another, much more robust amplifying device-a kind of sandwich made of a crystal with varying impurities added, which came to be known as the junction transistor. By 1951 Shockley's co-workers made his semiconductor sandwich and demonstrated that it behaved much as his theory had predicted.

For the next couple of decades advances in transistor technology drove the industry, as several companies jumped on the idea and set out to develop commercially viable versions of the device. New ways to create Shockley's sandwich were invented, and transistors in a vast variety of sizes and shapes flooded the market.

I think he felt cheated, and the story of the invention of the transistor caused him a lot of pain.

on Shockley's later years

Shockley's invention had created a new industry, one that
underlies all of modern electronies, from supercomputers
to talking greeting cards. Today the world produces about

ognized early on that the solution to one of the technological nightmares of the day-the cost and unreliability of the vacuum tubes used as valves to control the flow of electrons in radios and telephone-relay systems-lav in solid-state physics. Vacuum tubes were hot, bulky, fragile and shortlived. Crystals, particularly erystals that can conduct a bit of electricity, could do the job faster, more reliably and with 1 million times less power-if only someone could get them to function as

in Palo Alto, Calif, before attending Palo Alto Military Academy and Hollywood High School, he found his interest in physics sparked by a neighbor who taught the subject at Stanford University. Shockley earned a bachelos' degree from Caltech, and a Ph. D. at M.J.T. for a disserta-

as many transistors as it does

printed characters in all the newspapers, books, magazines

and computer and electroniccopier pages combined.

where his father, a mining en-

gineer, and mother, a mineral

surveyor, were on a business

assignment. Home-schooled

ley was born in London.

William Bradford Shock-

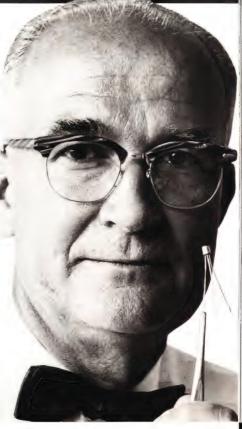
THE MINING ENGINEER'S SON, WHO REPLACED VACUUM TUBES WITH SEMICONDUCTING CRYSTALS Shockley and his team figured out how to accomplish this trick.

Understanding of the significance of the invention of what came to be called the transistor (for transfer resistance) spread quite rapidly. In 1956 Shockley, Bardeen and Brattain shared a Nobel Prize in Physics—an unusual awarding of the Nobel for the invention of a useful article.

Not content with his lot at Bell Labs, Shockley set out to capitalize on his invention. In doing so, he played a key role in the industrial development of the region at the base of the San Francisco Peninsula. It was Shockley who brought the

silicon to Silicon Valley. In February 1956, with financing from Beckman Instruments Inc., he founded Shockley Semiconductor Laboratory with the goal of developing and producing a silicon transistor. He chose to establish this start-up near Palo Alto where he had grown up and where his mother still lived. He set up operations in a storefront-little more than a Quonset hut-and hired a group of young scientists (I was one of them) to develop the necessary technology. By the spring of 1956 he had a small staff in place and was beginning to undertake research and development.

Until this time, nearly all transistors had utilized germanium because it was easier to prepare in pure form. Silicon offered advantages, at least in theory, mainly because devices made



# TRANSISTORS

At their most basic transistors are on-off wires-the gate, the source and the drain-separated by silicon that has been doped with an impurity, such as phosphorous or arsenic, to turn it into a semiconductor. A single sill chip may contain millions of transistors

ON When a positive charge is applied to the gate, the underlying conductor, allowing electrons to flow

OFF When no charge is applied to the gate, the silicon acts as an insulator, and the flow of electrons ceases

No charge on gate

from it could operate at higher temperatures. Also, silicon is a very common chemical element, whereas germanium is relatively rare. Silicon, however, melts at a much higher temperature, making its purification and processing more difficult

Shockley's group set to work to learn about the materials and processes that would be required. Only a couple of the scientists had any previous experience with semiconductors, so it was an intense learning time for most of us.

rking for Shockley proved to be a particular chalenge. He extended his competitive nature even to his working relationships with the young physicists he supervised. Beyond that, he developed traits that we came to view as paranoid. He suspected that members of his staff were purposely trying to undermine the project and prohibited them from access to some of the work. He viewed several trivial events as malicious and assigned blame. He felt it necessary to check

new results with his previous colleagues at Bell Labs, and he generally made it difficult for us to work together

In what was probably the final straw, he decided the entire laboratory staff should undergo polygraph tests to determine who was responsible for a minor injury experienced by one of the office workers.

While the group was making real progress in developing the technology needed to produce silicon transistors, Shockley's management style proved an increasing burden.

The group was in danger of breaking up. In fact, a few of the first recruits had already abandoned the lab for other iobs. To try to stabilize the organization, several of us went over Shockley's head, directly to Arnold Beckman, who had financed the start-up, suggesting that Shockley be removed from direct management of the lab and function only as a technical consultant

We grossly overestimated our power. Shockley survived our insurrection, and when it failed, we felt we had to look elsewhere for jobs. In the process of searching, we became convinced that our best course was to set up our own

# ROBERT NOYCE: MICROCHIP

only to print trans on wafers but also to lay tracks between them

friendly rivals were

In 1968 Noyce joined with rdon Moore to found Intel ler Noyce's shirt-sleaves dership, it soon prod

n. He died in 1990





# was Westin's one-button Service Express.

you get whatever you want. Whenever you want a From norm service in wake-up calls to you name it. Simply put your finger on the button. And put all of Westin at your feet.

Choose your travel partner wisely:

Call your travel agent or 1-800-WESTIN-1 www.westin.com

Now there's a new reason to stay with Westin: Starwood Preferred Guest." The fastest and most rewarding loyalty program. Stay five times between now and May 31st. get up to three free nights or 10,000 free airline miles. To learn more or to join now. call 1-888-625-4988 or visit www.starwoodhotels.com.



nee night awards range from 2,000 to 12,000 Starpoints per night based on hotel category. For full terms and conditions on

company to complete Shockley's original goal—which he had abandoned by this time in favor of another semicavor device he had also invented—to make a commer-

cial silicon transistor. This new company financed by Fairchild Camera & Instrument Corp., became the mother organization for several dozen new companies in Silicon Valley. Nearly all the scores of companies that are or have been active in semiconductor technology can trace the technical lineage of their founders back through Fairchild to the Shockley Semiconductor Laboratory. Unintentionally, Shockley contributed to one of the most spectacular and successful in-

Editor's note

n 1963 Shockley left the electronics industry and accepted an appointment at Stanford. There he became interested in the origins of human intelligence.

dustry expansions in history

Although he had no formal training in genetics or psychology, he began to formulate a theory of what he called dysgenies. Using data from the U.S. Army's crude pre-induction 10 tests, he concluded that African Americans were inherently less in-telligent than Caucasians—an analysis that stirred wide controversy among laymen



We knew we were onto something, [but] it's gone a great deal further than I could've imagined at the time.

JOHN BARDEEN, co-inventor of the transistor

and experts in the field alike. Nonetheless, Shockley pursued his inflammatory ideas in a series of articles and speeches. Regularly interrupted by boos and catcalls, he argued that remedial educational programs were a waste of time. He suggested that individuals with 10s below 100 be paid to undergo voluntary sterilization. He

donated openly and repeatedly to a so-called Nobel sperm bank designed to pass on the genes of geniuses. He filled a \$1.25 million libel suit against the Atlanta Constitution, which had compared his idues to Nazi genetic experiments; the jury awarded him \$1 in damages. He ran for the U.S. Senate on the dysgenies pataform and came in eighth.

Sadly, when he died at 79 of cancer, he regarded his work in genetics as more important than any role he played in creating the \$130 billion semi-conductor industry.

Intel co-founder Gordon Moore's rule of thumb, that chip power doubles every 18 months as prices decline, is now known as Moore's Law

### THE ENGINES OF CREATION Will Eric Drexler's nanotechnology do for the next century what addition chips did for this?

pace and time are relative. Our behavior is ruled by our subconscious mind. The most powerful machines are built one atom at a time. When the history of human civilization is rewritten a few centuries hence, the name Eric Drexer just hence he heavily the bear of the topic of Election and Fearly Drexer 43 is.

rewritten a few centuries hence, the name Eric Drexler just might appear alongside those of Einstein and Freud. Drexler, 43, is the founding father of nanotechnology, the idea of using individual atoms and

Drealer was an M.I.T. undergraduate studying genetic engineering in the mid-1970s when he had his epiphany if you could engineer DMA on a molecular level, why not build machines out of atoms, program them to build more machines and so on, until you had millions of infinitesimal nanobots, endlessly restocking the food supply, say, or swarming through the

bloodstream eradicating disease, or

molecules to build practical machines

THIS SILICON CEAR IS SMALER THAN A HUMAN HAIR

building skyscrapers from industrial waste? If nanotech was viable, it promised a gleaming future of virtually limitless wealth and endlessly renewable resources.

That's an immense iii. Drealer's idea was initially dismissed as science fiction, but even skeptics admit that unlike time travel and warp of view. nothing about it actually 15 MINATE of the science of science of t

-By Michael Krantz



# How can you make sure you get the future you deserve?

You've worked hard Achieved. Given back. And now it's time to make sure you and your family enjoy the future you've been working toward.

An American Express financial advisor can give you the expertise and insight you need to make smart decisions. We offer advice on funding your child's college education, investment strategies, and retirement planning Everything you need to take control of your future.

Call I-800-GET-ADVICE and own your world. www.americanexpress.com/advisors



Financial Advisors

#### CONSIDERING HOW WELL WE HANDLE EVERYTHING UNDER THE ROAD, IT'S NO WONDER OUR NEW 4x4 PERFORMS SO WELL ON THE ROAD.

SAMO SEDIMENTARY ROCK SHELE LIMESTONE SILTSTONE

Over the years, Jeep, vehicles have conquered just about every type of earthly terrain the world has to offer. Now, with our newest, most capable sport utility ever; we're ready to master the next level: the paved road.

Introducing the all-new 1999 Jeep Grand Cherokee.

A remarkable new vehicle with all the incredible off-

road strength and capability you expect from the leader in 4x4s, plus the added benefit of a smoother, tighter, more responsive on-road ride.

An enhanced Quadra-Coil<sup>181</sup> suspension and allnew steering system let the new Jeep Grand Cherokee handle the twists, turns, and obstacles of paved roads as

THE MOST CAPABLE

\*Based on AMCI overall on- and off-road performance tests using Grand Cherokee with



effortlessly as it maneuvers rocky mountains, canyons, and gulleys. A stiffer UniFrame construction reduces noise and vibrations while also creating a firmer, more precise ride on all types of surfaces.

To learn more about the all-new Jeep Grand Cherokee, please visit our Web site at www.jeep.com or call 1-800-925-IEEP And discover that what's on the road is now just as exciting as what's under it.

THERE'S ONLY ONE

GRAND CHEROKEE
SPORT UTILITY EVER

available Quadra-Drive's and V8 engine. Jeep is a registered trademark of DaimlerChrysler

# VIROLOGIST

# JONAS SALK Many scientists were racing to make a polio vaccine in the '50s—but he got there first

By WILFRID SHEED

ow many cases make an epidem ic? Survivors of the great polio plagues of the 1940s and '50s believe that in the U.S. the average toll in those years was "only" 1 victim out of every 5,000 people. Was that really all it took to scare the nation out of its wits, sending families scurrying in all directions-to the mountains, to the desert, to Europe-in vain hope of sanctuary

Perhaps polio's other name, infantile paralysis, had something to do with it. Images of babies in wheelchairs and tots on crutches tend to skew one's perception And just in case anyone wasn't scared enough, the National Foundation for Infantile Paralysis hammered the nightmare home with photos that seemed to show up ever where of sad-looking children in leg braces "Please give to the March of Dimes." Oh ves, indeed, five times at the same movie-or so it sometimes felt. It was inevitable

that whoever was first to allay such fears would become a national hero. "The Man Who Saved the Children" should be good for a statue in Eevery town in the world. And since the Fodds of a microbiologist's becoming even a little bit famous are a lot worse than 5,000 to 1, it was perhaps inevitable that this hero's achievements would immediately be disputed. In a scientific field so heavily manned. findings routinely crisscross and even minor discoveries can leave a trail of claims and counterclaims, not to mention envy and acrimony, that are truly incurable.

Thus a monument to the conquest of polio faithful to the facts would consist of not one man in a white lab coat but two of them glaring at each other. Both Drs. Jonas Salk and Albert

vincing cases for themselves and pretty good ones against each other too. But since the public usually prefers one hero to two, and since Salk did get there first, he got the monument. Between occasional

Sabin could and did make con-

shouts of "Eureka!" even the heroes of science tend to have quiet careers. But Salk's career stands out in at least two respects: the sheer speed with which he

outraced all the other



IRON LUNGS WERE WIDELY USED IN THE '50S TO VENTILATE POLIO PATIENTS WHO COULDN'T BREATHE ON THEIR OWN



tortoises in the field and the honors he did not receive for doing so. How could the Man Who Saved the Children be denied a Nobel Prize? Or summarily be turned down for membership in the National Academy of Sciences? What was it about Salk that so annoyed his fellow scientists?

That he was fast, there was no doubt. And hungry too. After taking brilliant advantage of the amazing public edu-

cation available to New Yorkers in the first half of this century, this son of Orthodox

Polish-Jewish immigrants whizzed through his medical training to fetch up at the University of Michigan an enviable fellowship to study virology under the

distinguished Dr.

Thomas Francis who, incidentally, would remain in Salk's corner for life, politics or no politics. Salk's major patron at Michigan, however, proved to be no one man but the whole U.S. Army, which needed a flu vaccine at once to help win World War II and was happy to complete Salf's education is speed under pressure. After that, it was a snap for him to set up his own peacetime lab at the University of Pittsburgh and equip it to the gills for the Great Crusade—the one that every immunologist in the capacity of the complete of th

Fortunately, Salk had somehow found time to do basic research on the virus and write a few theoretical papers, and it was these that caught the eye of Basil O'Connor, the zeal-use head of the infantile Paralysis Foundation, who decided to play a hunch and show some dimes in Salk's direction CHILDREN WING HEPED TEST THE SALK VACCINE GOT A BUTTON WITH THEIR BOOSTEE

POLIO PIONER

TO STATE OF THE PROPERTY OF THE

with instructions to get going. With that, the seeds of resentment, deep and abiding, were sown. By then, dozens of worthy researchers had been tolling far longer than Salk in the fields of polio and would have given their microscopes have given their microscopes. With the seed of the seed o

In fact, the key piece of re-

BORN Oct. 28, 1914, in East Harlem, N.Y. 1939 Graduates from New York University College of Medicine work on Irist 1949 Starts polio research with funding from the March of Dimes 1955 Announces success of his polio vaccine. Mass immunization begins Institute for Biological Studies in La Jolla, Calif.

#### **ALBERT SABIN**

be voked with Salk's. but Albert Sabin's contributions to logy extend far beyond his work in polio. Before developing his oral vaccine the Polish-born Sabin created vaccines against dengue fever and Japanese encephalitis. He was studying the role of viruses in cancer when he



search, available to all, was completed a few years earlier by the one undisputed hero of this story, Harvard's John Enders. It was his team that figured out how to grow polio in test tubes-suddenly giving vaccine hunters everywhere enough virus to work with.

ow the goal was truly in sight, and who got there first was largely a matter of speed-Salk's forteand luck. "Salk was strictly a kitchen chemist," Sabin used to gripe. "He never had an original idea in his life." But imaginative people perennially underrate efficient ones, and at the time. the kitchen chemist-who prepared his vaccine by marinating the virus in formalin-was just what the doctor ordered.

Salk and Sabin came from the two competing schools of vaccine research. Sabin, like Louis Pasteur, believed the way to produce immunity was to create a mild infection with a "live" but crippled virus, and he concocted his competing vaccine accordingly. Salk, from his flu-fighting days, knew the immune system could be triggered without infection, using deactivated, or

"killed." viruses. And. as it turned out, his quick-and-dirty killed viruses were better suited to a crash program than Sabin's carefully attenuated live ones. By 1954, Salk and Francis were ready to launch the largest medical experiment vet carried out in the U.S., vaccinating more than I million kids ages six to nine, some with the vaccine, some with a placebo. The children weren't told which they were getting

The vaccine worked. But the world of science has a protocol for releasing such findings: first publish them in a medical journal, and then spread the credit as widely as possible.

Salk took part in a press conference and went on radio but gave credit to nobody, including himself-of course, he was going to get the credit anyway. And that was the mistake that would haunt him. Radio was right; vanity

was wrong. This was not some breakthrough in carbuncle research but hot news that couldn't wait one more minute. Within the brotherhood of researchers, however, Salk had sinned unforgivably by not saluting either Enders or, more seriously, his colleagues at the Pittsburgh lab Everything he did after that was taken as showboatingwhen he opened the Salk Institute, a superlab in La Jolla, Calif., for the world's scientists to retreat to and bask in, and even when not long before his death in 1995, he started a search for an AIDS vaccine, to a flourish of trumpets and wel-

Just as some politicians are at their best when running for office, so Salk came into his own as a spokesman for vaccination. Although it is generally accepted in the field that the real man on the monument should be Enders (who in 1954 shared the only Nobel Prize given for polio research), it seems unlikely that either he or the pugnacious Sabin would have performed half so patiently as Salk the ceremonial chores expected of monuments or would have sat so politely

come new funding.



He shows the world how to eliminate paralytic polio, and you'd think he had halitosis or had committed a felony.

> BASIL O'CONNOR, National Foundation for Infantile Paralysis

through so many interviews and spread the gospel of disease prevention quite so far and wide and indefatigably.

And one last thing. Like the millions of American veterans who have never ceased thanking Harry Truman for dropping the Bomb and ending World War II, the folks who got their polio shot between the first Salk vaccine and the Sabin model have never had any quarrel with Salk's high place in history. (The two vaccines are now

given in alternating booster shots.) There are times when even genius has to give way to the old Yankee virtues of knowhow and can do. And if in this instance these happened to be embodied in the son of a couple of Polish-Jewish immigrants. well, a lot of that kind of thing happens in America.

Novelist and essayist Wilfrid Sheed wrote about his battle with polio in In Love with Daylight (1995)

### **DEATH OF SMALLPOX**





#### ConnectFirst fares. Move up to First Class for the price of Coach.

Just between us, there's no better deal in business travel than ConnectPrist from Northwest Airlines When you pay full-fare Coach on qualifying connecting flights, you receive an automatic upgrade to First Class. Plus, you receive LOOD WorldPerkel Borius Miles rounding. Think of it: the amenties and comfort of First Class for the price of Coach. For reservations, book online as waxwinva.com, call your travel agent or call Northwest at 1-800-225-2525 and ask for a ConnectFirst Jare. Next time, By First Class for the price of Coach. Hey, what they don't know back at the office worth but them.

### **MOLECULAR BIOLOGISTS**

# WATSON & CRICK

It took an ex-physicist and a former ornithology student—along with some unwitting help from a competitor—to crack the secret of life

By ROBERT WRIGHT

n Feb. 28, 1953, Francis Crick walked into the Eagle pub in Cambridge, England, and, as James Watson later recalled, announced that "we had found the secret of life." Actually, they had. That morning, Watson and Crick had figured out the structure of deoxyribonucleic acid, DNA. And that structure-a "double helix" that can "unzip" to make copies of itself-confirmed suspicions that DNA carries life's hereditary information.

Not until decades later, in ea of genetic engineering, would the Promethean power unleashed that day become vivid. But from the beginning, the Watson and Crick story had traces of hubris. As told in Watson's classic memoir. The Double Helix. it was a tale of boundless ambition, impa-

BORN Crick, on June 8. England: Watson, on April 1928. in Chicago 1951 Collaboration be 1953 The double helix 1961 Crick's team find: 1962 Nobel Prize, shared h Maurice Wilkins 1968 Watson's The le Helix is publis 1968 Watson is director of ld Spring Harbor Lab 1977 Crick begins brain arch at Salk Instit 1988 Watson named head of U.S. Human Geno

roject: later resigns

tience with authority and disdain, if not contempt, for received opinion, "A goodly number of scientists," Watson explained, "are not only narrow-minded and dull but also just stupid.") Yet the Watson and Crick story is also one of sublime harmony, an example, as a collegue put it, of the contemporary of

ways an odd pair. The British Crick, at 35, still had no Ph.D. The American Watson, 12 years Crick's junior, had graduated from the University of Chicago at 19 and nabbed his doctorate at 22. But they shared a certain wanderlust, an indifference to boundaries. Crick had migrated from physics into chemistry and biology, fascinated by the line "between the living and the nonliving." Watson had studied ornithology, then forsook birds for viruses, and then, doing postdoctoral work in Europe, took another sharp career turn.

At a conference in Naples. Watson saw a vague, ghostly image of a DNA molecule rendered by X-ray cystallography. DNA, he had heard, might be the stuff genes are made of: "A potential key to the secret of life was impossible to push out of my mind," he later wrote. "It was certainly better to imagine myself becoming famous than maturing into a stifled academic who had never risked a thought."

nad never risked a though This theme of Watson's



CRICK, LEFT, AND WATSON, THIRD FROM RIGHT, AT THE 1962 NOBEL PRIZE CEREMONY. NEXT TO CRICK IS MAURICE WILKINS. WHOSE LAB PROVIDED A CRUCIAL X-RAY IMAGE OF DNA

book—the hot pursuit of glory, the race against the chemist Linus Pauling for the Nobel Prize that DNA would surely bringge got bad reviews from the (relatively) genteed Crick. He didn't recall anyone mentioning a Nobel Prize. My impression was that known and the control of t

bridge lab, they bonded. Fatefully, such amity did not prevail at a laboratory over at King's College, London, where a woman named Rosalind Franklin was creating the world's best X-ray diffraction pictures of DNA. Maurice Wilkins, a colleague who was

also working on DNA, disliked the precociously feminist Franklin, and the feeling was mutual. By Watson's account, this estrangement led Wilkins to show Watson one of Franklin's best pictures yet, which hadn't been published.

"The instant I saw the picture my mouth fell open," Watson recalled. The sneak preview "gave several of the vital helical parameters."

Franklin died of cancer in 1958, at 37. In 1962 the Nobel Prize, which isn't given posthumously, went to Watson. Crick and Wilkins. In Crick's view, if Franklin had lived, "it would have been im-

Talk to James Watson on Wed., March 24, 7 p.m. E.T. at chat.yahoo.com/time



possible to give the prize to Maurice and not to her" because "she did the key experimental work." And her role didn't end there. Her critique of an early Watson and Crick theory had sent them back to the drawing board, and her notebooks show her working toward the solution until they found it: she had narrowed the structure down to some sort of double helix. But she never employed a key tool-the big 3-D molecular models that Watson and Crick were fiddling with at Cambridge.

It was Watson who fit the final piece into place. He was in the lab, pondering cardboard replicas of the four bases that, we now know, constitute DNA's alphabet: adenine, thymine, guanine and cytosine, or A, T, G and C, He realized that "an adenine-thymine pair held together by two hydrogen bords was identical in shape to a guanine-cytosine pair. These pairs of bases could thus serve as the rungs on the twisting ladder of DNA.

Here—in the "complementarity" between A and T, between C and G-lay the key to replication. In the double helix, a single strand of genetic alphabet—say, CAT—is paired, rung by rung, with its complementary strand, GTA. When the helix unzips, the compleMODEL SUGGESTS COMPLEXITY BUT DNA IS A SIMPLE MOLECULE

### WATSON ON PAULING

in 1931, when he was 30, Linus Pauling knew he was the world's best chemist. Fen years later his peers agreed, by then. The Nature of the Chemical Bond (1939) was already on its way to becoming the most influential chemistry book of the century. His biggest biological success came from his 1951 proposal of the alpha-helical fold for protein indecisels, which everybody etce thought were too legge and complete to study. His findings the control of the co

inner, unexpectedly, ne struck out when he proposed an inplausible, three-chain helis for DAN. Several months later. In Cambridge, England, Francis Crick and I, apprehensive that Linux might bat again, found the double helix. Why Linux Sailed to hit this home run will never be known. His wife Ava Helen is said to have told Linux bat he should have worked harder. I believe the decade following World War II may have had too many agonizing moments for the Pauling family.

They areae chiefly from his opposition to nuclear weapons. After the first alom bombs were used, he began giving speeches expressing his concern that our nation's growing anticommunist lears were forcing us into an insane nuclear-weapons race. He was broadly labeled a pink, if not a red. J. Edgar Hoover personally pursued him, Senator McCarthy called him a security risk, and the State Department took away his passport. Linus' last big wish was to do for medicine.

what he had done for chemistry. But using vitamins to conquer mental diseases, the common cold and cancer proved more than a tall order even for him. That Linus did not get his final triumph should not surprise us. Failure hovers uncomfortably close to greatness. What matters now is his perfections, not his past imperfections.

I most remember Pauling from 50 years ago, when he proclaimed that no vital forces, only chemical bonds, underlie life. Without that message, Crick and I

might never have succeeded.

—By James D.

Walson

A NOBEL FOR CHEMISTRY AND A SECON ONE FOR PEAC



By the time your show SCROLLS up, it'll be in SYNDICATION.

Finding out what's on can take an eternity That's why we have RCA TVs with Guide Plus+ Gold" - the TV programming guide you control. Use the remote to browse at your own pace. Hit SORT to list movies and sports by theme. In the mood to laugh? Click on comedy, Cry? Click drama. Cheer? Click football. (You get the idea.) You even get a description of the shows. And if there's something you want to tape, just highlight the program and hit the One-Touch Record button on your remote. And you're done - no studying the manual or enrolling in

"How to Program Your VCR" evening classes. Best of all, this interactive program guide is built in to many RCA TVs. So there's no monthly fee. And no need to watch that slowpoke scrolling channel ever again, unless of course you're having trouble sleeping.

the channel channel







mentary strand becomes a template; its G, T and A bases naturally attract bases that amount to a carbon copy of the original strand, CAT. A new double helix has been built.

Watson's famous "Aha!" was but the last in a long chain. It was Crick who had fastened onto a chemist friend's theoretical hunch of a natural attraction between A



ROSALIND FRANKLIN Her images of DNA were key to understanding its structure, but she died

and T. C and G. He had then championed the complementarity scenario—sometimes against Watson's resistance—as a possible explanation of "Chargaff's rules," the fact that DNA contains like amounts of adenine and thymine and of guanine and cytosine. But it was Watson who had first learned of these rules.

As Horace Freeland Judson observed in The Eighth Day of Creation, this sort of synergy is, above all, what Rosalind Franklin Lacked. Working in a largely male field in an age when women weren't allowed in the faculty coffee room, she had no one to bond with—no supportive critiie whose knowledge matched her gaps, whose gaps her knowledge matched.

Writing up their findings for the journal Nature, the famously brash Watson and Crick donned a British reserve. They capped a dry account of DNA's structure with one of the most famous understatements

### IAN WILMUT: BREAKING THE CLONE BARRIER

#### By DR. BERNADINE HEALY

In the closing years of this millennium, a quiet, unassuming British embryologist armed lan William tast out to improve the productivity of tarma minstal and long the way set off a starma minstal and long the way set off a seal from a madult to the seal of t

skin, it could not be deprogrammed.
Yet Wilmut did it. From a single mammary
cell, taken from an adult ewe, he and his
colleagues at the Roslin Institute cloned a sheep
called Dolly and introduced her to a skeptical

world in February 1997.

Perhaps it was his isolation in a rural part of Scotland (the bucolic region of Midlothian, where he and his wife treasured long

walks, gardening and the distinctive Scottish sport of curling) that permitted him to resist the naysayers. Or perhaps it was the isolation of the remote field of animal husbandry that fostered his originality.

In any event, he seemed as surprised as anyone else that his modest and eerily simple experiment, conducted with limited funding, should have as much impact on our sense of what it is to be human as anything since Adam and Eve. Wilmut wanted to use his cloning technology to improve livestock, "I think we should trust the farmers," he said. Any experimentation with humans, he the level of cells and proteins. It would be ethically unacceptable, he said, to use his technique to create a human clone

That, however, was the very thing that caught the world's imagination. Human cloning! The stuff of science fiction seamed about to become reality. Even before other labs had confirmed Wilmut's discovery, a Hanvard Seen proclaimed his intention to clone humans for commercial purposes. Cloning, he declared grandicisely, was "the first serious step toward".

becoming one with God. —
Few scientists found Seed's sound bites
Few scientists found Seed's sound bites
found for the seed of the seed of

Dolly shakes our ethical foundations, our some control forms, even our religious beliefs. What is the role of clones in society? Are they an asexual variant on incest? Can they become human slaves or organ donors? Who are their parents? Who is their family? Are they made in God's

image or in man's?

Human cloning is too profound to be underlaken without the broadest possible understanding of its implications for our culture, our traditions, our values, our laws and the future of the human gene pool. But it so to deay to talk about Dolly in a world that doesn't share a seems that anything goes. Irrack LAustraliac. Other seems that anything goes. Irrack LAustraliac. China and most European countries have prohibited human cloning. Other countries, like the U.S.

have not.

What makes this challenge even more difficult is that Dolly is not terribly real for most people. The very strangeness of her origin makes it seem abstract and irrelevant to everyday lives.



WILMUT WITH DOLLY: AS SURPRISED AS ANYONE ELSE BY THE EARTHQUAKE HIS EERILY SIMPLE EXPERIMENT TRIGGERED

Will cloning be a technology of the very wealthy and the depraved, sneaking up on the rest of the world without its understanding? Perhaps, like nuclear warfare or human eugenics, the full meaning of cloning will be felt only when we get

a taste of its abuse.

Do we wait for the first human infant to be produced, in secret, by a Richard Seed or his offshore equivalent? I am Wilmut, the soft-spoken scientist who started this noisy revolution, says, on. The father of three (one of them adopted), he speaks passionately of honoring the individually barned. (I. Human cloning, he says, should be barned.

Dr. Bernadine Healy, the former director of the NIH, is dean of the College of Medicine and Public Health at Ohio State University Femicially J. Patricing and Security >>> AT&T virtual networking solutions.



Start your net working.

Everyone and everything working together in a whole new way. To make your business

-

AT&T net working





in the history of science: "It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material." They faced the question of byline: Watson and Crick. or Crick and Watson? They flipped a coin. The double helix—both

The double helix—both the book and the molecule—did nothing to slow this century's erosion of innocence. Watson's account, depicting researchers as competitive and spiteful—as human—

# The structure was too pretty not to be true.

JAMES D. WATSON, The Double Helix

helped de-deify scientists and bring cynicism to science writing. And DNA, once unveiled, left little room for the ethereal, vitalistic accounts of life that so many people had found comforting. Indeed, Crick, a confirmed agnostic, rather liked deflating vitalism -a mission he pursued with zeal, spearheading decades of work on how exactly DNA builds things before he moved on to do brain research at the Salk Institute for Biological Studies in La Jolla, Calif

Watson drifted from pure science into administration. As director of the molecularbiology lab at Cold Spring Harbor, N.Y., he turned it into a scientific powerhouse. He also served as head of the Human Genome Project, absorbing some fallout from the highenergy ethical debates whose fuse he and Crick had lighted nearly four decades earlier.

nearly tour decades earner.
As the practical and philosophical issues opened by the
double helix continue to unfold, policy, philosophy and
even religion will evolve in response. But one truth seems
likely to endure, universal and
immutable. It emerges with
equal clarity whether you examine the DNA molecule or the
way it was revealed. The scret
of life is complementarity.

Robert Wright is author of The Moral Animal: Evolutionary Psychology and Everyday Life

# PATRICK STEPTOE AND ROBERT EDWARDS: BRAVE NEW BABY DOCTORS

all and silver-haired, with soffly reassuring blue eyes, Dr. Patrick Christopher Stopteo locode at it he'd just stepped out medical revolutionery, On. July 25, 1978, as hundreds of reporters descended on the sleep, Feight mill bown of Oldham, the 65-year-oil obstetrican delivered the world's first "test-tube baby", in a bid slid, or in vitor. From the egg and sperm of a worling-class copie who had tried for years to have a child; she seemed as mirratulous as any baby in 2,000 years. collective to Stotele and

The astonishing feat brought instant celebrity to Steptoe and his partner, Robort Edwards—as well as a barrage of criticism. The Roman Catholic Church and other religious groups denounced it as playing God, and even scientists like James Watson, unraveler of DNA, were worried about inkering with a process as sacrosanct as procreation. But the debate faded as it became clear that the brave new world of babymaking that Steptoe had ushered in was providing a desparately sought service.

Today such artificially assisted pregnancies are commonplace (an estimated 300,000 have taken

can esminated 300,000 nave daten place in the past 20 years) and are to would be parents—from using frozen would be parents—from using frozen picking the number, sex and genes of their bables. These innovations have freed women from the lyramny of their bibliogical clock, triggered an explosivo of multiple births, even made the sex act irrelevant in conception—all while setting the stage for still more

unsettling spectacles to come, such as human cloning BY FIVE MONTHS, "TEST TUBE" BABY BROWN WAS JUST A BABY LIKE ANY OTHER



Stepton, who witnessed many of these changes before his death at 74, in 1988, was an unifiely revolutionary, Born to a church organist father and social-service worker mother in rural church organist father and social-service worker mother in rural music. During World Wer II, he was captured by the Islains after his ship was sunk and got himself tossed into solitary for helping other prisoners seages. Settling up a precioe in obstetrics and proposed to the proposed of the p

developed a way to tertilize human eggs in the tab. Edwards had worked only with eggs obtained from ovaries removed for medical reasons. Steptoe realized that with the second reason of the second realized that with a work. If the eggs were retined at just the right thus and then fertilized in vitro, they could be transferred into the uterus, thereby circumventing the sometimes perfloss journey down the Fallopian

> For more than a decade, Steptoe and Edwards performed dozens of invitro experiments-paid for in part by Steptoe's earnings from legal abortions-but none of the 30 or so pregnancies lasted more than 10 weeks. Finally, the pair decided that instead of waiting four or more days while the fertilized egg underwent about 100 divisions, they would implant it after just 21/2 days, at the eight-cell stage The daring strategy worked-and just short of nine months later, while all the world seemed to be watching, Steptoe delivered Baby Brown by caesarean -By Frederic Gold section.



ANTHROPOLOGISTS

# THE LEAKEY FAMILY

Without the groundbreaking—and backbreaking—efforts of Louis, Mary and Richard, the story of how we evolved would still be largely untold

By DONALD C. JOHANSON

ouis Leakey's enthusiasm for Africa and the search for earliest man were infectious. Speaking before a packed lecture hall in his staccato-like voice, punctuated by rapid inhales, he cast a spell, making each listener believe he was speaking only to him or her His following in America was cultlike. Consumed with devotion and swept up in his charisma, many developed a desire to follow somehow in his footsteps, to please him.

No wonder Leakey became the patriarch of a family that dominated anthropology as no

LOUIS AND MARY SHOW OFF THE SKULL AND UPPER JAW OF ZINJANTHROPUS, WHICH THEY NICKNAMED "DEAR BOY" family has dominated a scientific field before or since. Not honly did Louis, his wife Mary and their second son Richard make the key discoveries that shaped our understanding of human origins, but they also inspired a generation of researchers (myself included) to pick up where they let for

ness my first visit to Nairobi in 1970 when Louis ceremoniously led me to the room housing the crown jewels of human evolution. Every fossil took on a mythical cast as he waxed eloquent about how it revealed some magic moment of our origins. Here he was, the grand master, sharing his passion, knowledge and intuition with a new disciple. He was often like that: generous.

I recall with great fond-

open, supportive, always trying to win new converts to his way of working, his way of interpreting the past.

Born in Kenya of English missionaries, Louis was initiated by tribal elders into the native Kikuyu society. As a young man he was adventurous, impulsive, driven, ruggedly hand-some and romantically African. Fresh out of Cambridge, Louis set out to prove Darwin's theory that Africa was humankind's homeland—and to discover evidence for his own belief that true man, Homo, had a very ancient origin.

In 1933, when Louis met and fell in love with 20-yearold Mary Nicol, he already had a family, but in flagrant disregard of the social norms of the time, he divorced. The synergy of Louis and Mary's union was obvious from the outset. In contrast to Louis' charming, gregarious, outgoing nature, Mary was shy, reserved, socially uncomfortable and, in her own words, not very fond of other people. Mary preferred to carefully evaluate scientific evidence before reaching any conclusions; Louis, on the other hand, was often impulsive and cavalier in his proclamations. Rigorous in her approach, intensely focused and remarkably diligent, Mary quickly set new standards in the study of African prehistory, culminating in her stunning monographs on the archaeology of Olduvai Gorge.

It was Mary's 1959 discovery of the Zinjanthropus cranium at Olduvai that captured worldwide attention and made the Leakeys a household name. Building on this find. Louis and Mary attracted a multidisciplinary team of specialists to work at Olduvai and alunched the modern science of paleoanthropology, the study of human origins.

It was then, after decades of the Leakeys' working in isolation and operating on shoestring budgets, that the National Geographic Society agreed to support and promote the 'Leakey legacy'. Louis was, for Geographic, everything it could have wished for in an African adventurer. He was the self-

Talk to Richard Leakey Sunday, March 28, 10 a.m. E.T., on AOL (Keuword: AOL Live)







proclaimed white African.

Following the success of Zinjanhropus, Louis began spending less and less time at Oldwax, which became Mary's domain. For most of the next 25 years she worked and lived there with her staff, her dogs and selected visitors. Until his death in 1972. Louis visited occasionally but spent most of his time traveling around the finds to support an ever expanding list of research projects. Most notable were the

When the first men were fashioned in the Good Lord's forge,/ He sent them, it seems, to Olduvai Gorge.

> the British magazine Punch

field studies he launched of the living great apes: Jane Goodall's chimps, Dian Fossey's gorillas and Biruté Galdikas' orangs.

In 1978 Mary made what may have been her greatest find. Her team was re-exploring a site in Tanzania called Laetoli-40 years after Louis had incorrectly assumed that the absence of tools there implied that hominid fossils would not be found-when they discovered a trail of remarkably clear ancient hominid footprints impressed and preserved in volcanic ash. It was a stunning glimpse of the world 3.6 million years ago. If only Louis had lived to see it.

A detailed scientific study of the Laetoli hominid fossils confirmed that they belonged to a new hominid species, best represented by the 3.2 million-year-old Lucy skeleton I had discovered four years earlier at

Hadar, Ethiopia. When I presented these findings in May 1978 at a Nobel symposium in Sweden, Mary had already agreed to be one of the coauthors on the scientific paper defining the new species, Australopithecus afarensis. A few months later, however, when the paper was being printed. she cabled me demanding removal of her name. I respected her wishes and had the title page redone. Like Louis, she did not believe Australopithecus was our ancestor; if her finds at Laetoli were our ancestors, they had to be Homo.

It was a blustery, wintry afternoon in 1970 at the University of Chicago when I first met Louis and Mary's son Richard. He had just completed a preliminary presentation on his new finds from Lake Turkana (then Lake Rudolf), I told him I would be in Nairobi the next summer and wanted to see his exciting hominid fossils. A year younger than I. he had chosen, after becoming disenchanted with the safari business, to follow in his parents' footsteps. It appeared that he too possessed the "Leakev luck" and was well on the way to stardom in paleoanthropology

Our first meeting in Nairobi was cordial, and Richard dazzled me with remarkable specimens: a friendship was simmering, Beginning preparations for my research in Ethiopia's Afar region, I was a frequent visitor to Nairobi, and Richard offered suggestions and appeared supportive of my efforts. But our conversation always had a dimension of competition. and even though we offered each other advice, in retrospect it was as if we were

looking for chinks in each other's armor. Both of us were strong in character and ultimately, almost inevitably, this led to our estrangement in 1981. We were the Young Turks of anthropology in those days, staunchly defending our interpretations of human evolution. Perhaps now, with the mellowing of age, it is time to break the silence.

uch like his father, Richard has strong opinions and is often hasty to make pronouncements about his discoveries. This was especially true when he presented, in 1972, a Homo skull that he believed was 2.9 million years old. Adhering to his father's belief in very early Homo, this find, older than all Australopithecus fossils then known, was a welcome and stunning endorsement of Louis' views, Louis and Richard had been feuding over museum matters, and this discovery brought them together again in a final meeting shortly before Louis died. He spent his last days comforted by the knowledge that he had been proved correct. Since then, however, the skull has been correctly dated to 1.8 million years; despite Louis and Richard's objections. most anthropologists today believe Australopithecus is indeed one of our ancestors

Richard, meanwhile, continued his rise to prominence. Fossil finds such as the aston-ishingly complete 1.6 million-year-old skeleton of an African Homo erectus (Homo eregaster to some) and the Black Shull have added immeasurably to our knowledge of human origins. His career benefited from best-selling books, a television series on human evolutions are some human evolutions are some human evolutions.

tion and popular lecture tours. Paleoanthropology has not been his only passion, however. He will probably be best remembered in Africa for founding an opposition political party in Kenya in 1995, after which he suffered public humiliation, including being beaten with leather whips. But Richard has proved astonishingly resilient. Even after a life-saving kidney transplant in 1979 (a gift from his estranged brother Philip) and the partial loss of both legs in a 1993 plane crash, he continues to exude confidence.

In 1989 President Daniel arap Moi appointed Richard head of what is now the Kenya Wildlife Service. Richard raised hundreds of millions of dollars and revamped Kenya's approach to wildlife conservation, heavily arming antipoaching units

# MARGARET MEAD

The century's foremost woman anthropologist Margarett Mand was an American too. On dozens of field trips to study the ways of primitive societies, who found evalence to considerate the control of the c



and instituting a controversial edict permitting the shooting of poachers on sight. He resigned in 1994 amid politically motivated accusations of corruption, racism and mismanagement—only to be reinstated by Moi 4% years later.

Nevertheless, the Leakeys will forever be synonymous with paleoanthropology and even today show all signs of being alive, well and contributing productively to the field. Richard's wife Meave, a trained zoologist, and their eldest daughter Louise are currently leading teams to north-ern Kenya, where hominids in excess of 4 million years old are being found. The stage is set for the first family of anthropology to continue well into the next century.

Donald C. Johanson is director of the Institute of Human Origins at Arizona State University



### WHERE ANTHROPOLOGY MEETS PSYCHOLOGY

I mid-century, anthropology textbooks painted a simple picture of the plight for our ancestors on the African savarina: them against the world. Lions environment was considered bloomed. This hostile environment was considered bloomed. This hostile environment was considered bloomed. The properties of the properties o

During the 1960s and early 70s, three biologists—William Hamilton, George Williams and Robert Troub.

William Hamilton, George Williams and Robert Troub.

Under the William Hamilton of the Williams and Robert Troub.

By Specials, It last You and the Williams of the Will

Oddly, Darwinian success in a dog-eat-dog social world turns out to involve lots of mushly feelings. Swoons of romance, love of kin, devotion to friends and pity for the needy could be useful tools in the social jurgle. Even conscience and the sense of justice are now said to have roots in our genes. That's the good news. The bad news is that a

subtle, often unconscious, bias toward ourselves, our

kin and our friends can narrow altruism and color moral judgments. "Deception and hypocrisy are very human devices for conducting the complex daily business of social life," wrote Edward O. Wilson in Sociobiology (1975), which brought the new paradigm to the world's.

attention.
Wilson's book, though mainly about nonhuman
animals, made enough such pronouncements to get him
vilified as a "biological determinist" and a menace to
society. While he was speaking at a scientific
conference, a protester called him "all wet" and

dumped water on him.
It didn't work. Today the new, improved version of human sociobiology—evolutionary psychology—is flourishing. Such scholars as Leda Cosmides, John Tooby and Steven Pinker (author of How the Mind Works) have begun to explain human language, logic

and perception in Darwinian terms. You know a discipline has arrived when its detractors start depicting themselves as radicals assaulting the intellectual status quo. This fall John Horgan (The End of Science) will come out with a book that, according to its publisher's catalog, "boldy that, according to its publisher's catalog, "boldy visualization of the publisher has been considered to the publisher has been co

Q. Its eah is forward. Will that give you more room in the backseat? Q. Its bood is short.

Can that be the secret to a bigger

specially treated glass. Is the growthouse effect reduced? Q. The thinking behind its mirror came from a race vehicle. Does that help quiet the

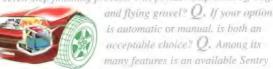
wind? Q. Two of its four engine mounts are liquid-filled. Are there solid results in noise reduction? Q. Its electronic

# So many questions.

system allows the available engine, transmission, speed

control, and speedometer to carry on an intelligent conversation. Is the translation better performance? O. It was engineered for handling.

But can it handle the grocery store? Q. It's protected by a seven-step finishing process. Will produce help ward off bugs



Key. Can a key he a deterrent against auto theft?

One answer.



Stratus The New Dodge

1-800-4-A-DODGE or www.4adodge.com

## DINERS CLUB, VOTED #1 REWARDS PROGRAM, AGAIN. FREQUENT TRAVELERS SURE KNOW HOW TO MAKE A POINT.



It wasn's surprising when the readers of InsaGeR-pier magazine voted our Club Revends' program 'the best' for the second year in a row. Attra all everything we do is with the needs of the frequent traveler in mind. That's why our reverds program is the only one that allows you to earn miles that can be redeemed on every major U.S. sirline. With no mileage cag and no expiration date. Plus, you can redeem your revends for free hotel stays, vecation packages, or name-brand merchandise. And, of course the Diners Club Clard is welcomed by artimes, hotels, can rental companies and millions of other places you go. So call 1 St00 2 DINERS today.



BREAKING THE PLASTIC MOLD.

#### ENVIRONMENTALIST

# RACHEL CARSON

Before there was an environmental movement, there was one brave woman and her very brave book

#### By PETER MATTHIESSEN

he was always a writer, and she always knew that. Like Faulkner. Fitzgerald, e.e. cummings, Millay and E.B. White. 10-year-old Rachel Louise Carson, born in 1907 in the Allegheny Valley town of Springdale, Pa., was first published in the St. Nicholas literary magazine for children. A reader and loner and devotee of birds, and indeed all nature. the slim, shy girl of plain face and dark curly hair continued writing throughout adolescence, chose an English major at Pennsylvania College for Women and continued to sub-

BORN May 27, 1907. In Springdale, P. 1907. In Springdale, P. Women 1928 Graduates from Pa. College for Women 1929 Spends first summer in Woods Hole 1932 Receives M.A. from Johns Hopkins University 1936 Takes a job with the 1936 Publishes The Sea Around 2 Spring stirs. 1956 Silent Spring stirs. 1956 Silent Spring stirs. 1956 Dishall controversy. 1956 Dishall controversy. mit poetry to periodicals. Not until junior year, when a biology course reawakened the 'sense of wonder' with which she had always encountered the natural world, did she switch her major to zoology, not yet aware that her literary and scientific passions might be complementary.

Graduating mugna cum laude in 1929. Carson won her master's degree in zoology at Johns Hopkins, but increasing family responsibilities caused her to abundon her quest for a her to abundon her quest for a the University of Maryland, continuing her studies in the summer at the Marine Biological Laboratories in Woods Hole. Mass. It was there, in her cardy 20c, that she first saw—and beenormous mischeries of the season

In 1935 "Bay" Carson, as some friends knew her, took part-time work writing, seience radio scripts for the old Bureau of Fisheries, a job that led, in 1936, to a full-time appointment as a juntor aquatie biologist. To eke out her small income, she contributed feature articles to the Baltimore Sun, most of them related to marine zoology. Though her poetry was never to be pub-



A SHY, MELANCHOLY EXPRESSION BELIED A POWERFUL WILL

lished, a strong lyrical prose was already evolving, and one of her pieces for a government publication seemed to the editor so elegant and unusual that he urged her to submit it to the Atlantic Monthlu

"Undersea", the young writer's first publication in a national magazine. September 1937), was seeminal in theme and tone to all her later writing, Together with an evocative Stan feature. "Che-sapeake Eck's Seek the Sangasso Sea." From every river and stream along the whole Atlantic Coast, eels are hurrying to the..." it was the starting point for her first book.

TIME MARCH 29, 1999

Under the Sea-Wind (1941). Carson's favorite among her books, would pass almost unnoticed. Meanwhile, her editorial duties in what would become the Fish and Wildlife Service (Fws) had increased. In 1946 she was promoted to information specialist, and in 1949 became chief editor of publications.

In their first meeting, the naturalist Louis Halle found Carson "quiet, diffident, neat, proper and without affectation." Nothing written about her since seems to dispute this. But for all her modesty and restraint, she was not prim. She

187



MAGAZINE ARTICLE, WHICH LED TO HER LANDMARK BOOK

had a mischievous streak, a tart

A decade after her first book, her agent circulated a

second work in progress that

and geological aspects of the

of Edith Oliver at the New

William Shawn, who recog-

was published as The Sea Around Us. It won the John

the year sold more than

Carson to retire

from the Fws in

1952 to write full

she bought land

time. That summer

tongue and confidence in her own literary worth.

same year, she offered an article to Reader's Digest on insecticide experiments going on at Patuxent, Md., not far from her home in Silver Spring, to determine the effects of DDT on all life in affected areas. Apparently the Digest was not interested. Carson went back to her government job and her sea trilogy, and not until after the third volume had been completed did she return to this earlier preoccupation

Meanwhile, the insecticide barrage had been augmented by dieldrin, parathion, heptachlor, malathion and other fearful compounds many times stronger than DDT, all of which the government planned to distribute through the Department of Agriculture for public

furor arose across the country over the spraying of cranberry plants with aminotriazole. which led to an Agriculture Department ban against all cranberry marketing just in time for Thanksgiving 1959.

Though others had been warning of pesticide dangers, it was Carson who struck upon the metaphor that would draw all these dire warnings to a point. "There was once a town in the heart of America where all life seemed to live in harmony with its surroundings ... Then a strange blight crept over the area and everything began to change...There was a strange stillness...The few birds seen anywhere were moribund: they trembled violently and could not fly. It

#### To stand at the edge of the sea ... is to have knowledge of things that are as eternal as any earthly life can be.

RACHEL CARSON, Under the Sea-Wind



E FOCUSED ATTENTION ON THE EFFECTS OF DOT ON BIRDS 1945. Carson and her close colleague Clarence Cottam had

and built a cottage on the Sheepscot River near become alarmed by government abuse of new chemical West Southport on the coast of Maine, where she and her pesticides such as DDT, in parmother had visited since 1946. ticular the "predator" and Her new celebrity also "pest" control programs, which were broadcasting poisons gave her the opportunity to speak out on concerns she felt with little regard for the welfare of other creatures. That strongly about. As early as

use and commercial manufacture. "The more I learned about the use of pesticides, the more appalled I became," Carson recalled, "I realized that here was the material for a book. What I discovered was that everything which meant most to me as a naturalist was being threatened, and that nothing I could do

would be more important With her fame and eloquence and reputation for precision. Carson could count on the support of leading scientists and conservation organizations, and was well positioned to command a hearing. Even so, the Digest and other magazines had little interest in this gloomy subject. Then, in 1957, there was a startling wildlife mortality in the wake of a mosquitocontrol campaign near Duxbury, Mass., followed by a pointless spraying of a DDT/fuel-oil mix over eastern Long Island for eradication of the gypsy moth. Next, an allout war in the Southern states against the fire ant did such widespread harm to other crea

tures that its beneficiaries cried

for mercy; and after that a great

was a spring without voices. On the mornings that had once throbbed with the dawn chorus of scores of bird voices there was now no sound; only silence lay over the fields and

woods and marsh. Silent Spring, serialized in the New Yorker in June 1962, gored corporate oxen all over the country. Even before publication, Carson was violently assailed by threats of lawsuits and derision, including suggestions that this meticulous scientist was a "hysterical woman" unqualified to write such a book. A huge counterattack was organized and led by Monsanto, Velsicol, American Cyanamidindeed, the whole chemical industry-duly supported by the Agriculture Department as well as the more cautious in the media. (TIME's reviewer deplored Carson's "oversimplifications and downright errors ... Many of the scary generalizationsand there are lots of them-are patently unsound."

By year's end, Audubon and National Parks Magazine had published additional excerpts from the book, and all

## "IF YOU DON'T WANT TO SACRIFICE ANYTHING **BUT STILL NEED** AN AFFORDABLE NOTEBOOK. THIS DELL'S THE WAY TO GO."

-PC MAGAZINE EDITORS' CHOICE 2/23/99"

#### SO GO ALREADY.

www.dell.com/inspiron7000

**DELL INSPIRON 7000 A366LT** 

#### DELL° INSPIRON° 3500 A266XT PENTIUM" II PROCESSOR AT 266PE N

#### Light Weight, Light Price

- . 13 3" XGA Active Matrix Bisplay
- · 32M8 SDRAM CERNIN Max
- · 3 268 Ultra AlA Hard Drive . Modular D4X Max. Virgidite CD-RDM
- . Medular Floppy Drive
- . 9 Cell interspect \_ thous are distres,
- · Internal ShK capable is their with
- "mail fifter to meet finest interior Acress.
- . MS. Works State Provide Manage of Force
- · MS Windows 1 St. Inschiped
- · 3 Year I meta-t Vocasiant,
- \* Epigrane to and Stiff Siting ATA reason from and Can
- \* Add as APC Notellinia Songe Protection 168 S. 3
- \* Add an HP" (Ittoeslet "Ty A. . . . p. Fra for \$459

Personal Lease \$75/Ms 36 Vics

E+VALUE CODE: 78134-800319

#### All-in-One Multimedia Performance

- . 15 Xio A Live Matrix Explan-. STMB SCHAM RESIVE Max 7
- . ICB Lifes AIA Hard Brive
- · riem a role Lumba 24X Max Variable
- CILE IV and I specified
- · 2\* A P MAR AT BASE 17 Pro 30 Votes.
- · 40 Subsumd Sound and Hardware Wavefatre
- . 1) Call Intelligent Lithium for Battery
- . Internal 50x Capabic Val Fax Moden with
- . Mis Wires Note 93 with Money 45 Basic
- . Ms Westure 98 Touchpart
- . 3 Year Limited Warranty

ersinii Leuse \$117/Mo 36 Mgs E-VALUE CODE: 78134-800329b

#### UPGRADE TO THE EDITORS'

- CHOICE NOTEBOOK # 1508 to the Att many or sales on
- \* X DUF AND D ... \$10



WWW.DELL COM / FORLIS

800-757-8421

BUILD YOUR OWN AND ORDER ONLINE



Are you Y2K OK? www.dell.com/v2k Phone Hours: M-F 7a-11p · Sat-Sun 8a-8p CT In Canada? call 800-839-0148 In Mexico, call 001-800-210-7607

Personal leasing arranged by Dell Financial Services LP, an independent entity, to qualified customers. Amount of monthly lease payments above based on 36-month lease. All above monthly lease payments exclude taxes which may vary flor example. Hartford City. IN sales tax "\$5,60/month).

Shipping cost due with first payment. No security deposit required; subject to credit approval and availability. Lease terms subject to change without notice.





#### FEWER PESTICIDES MEANT TRONGER EGGS-AND NEW HOPE-FOR THE BALD EAGLE

but the most self-serving of Carson's attackers were backing rapidly toward safer ground. In their ugly campaign to reduce a brave scientist's protest to a matter of public relations, the chemical interests had only increased public awareness. Silent Spring became a runaway best seller, with international reverberations. Nearly 40 years later, it is still regarded as the cornerstone of the new environmentalism.

Carson was not a born crusader but an intelligent and dedicated woman who rose heroically to the occasion. She was rightly confident about her facts as well as her ability to present them. Secure in the approval of her peers, she remained remarkably serene in the face of her accusers. Perhaps the imminence of her own mortality had helped her find this precious balance and perspective. In most photographs, the pensive face appears a little sad, but this was true long before she knew that she had cancer. She was 56 when she died in April 1964.

The beauty of the living

world I was trying to save," she

Man is a part of nature, and his war against nature is inevitably a

war against himself. PACHEL CARSON in a CBS television

wrote in a letter to a friend in 1962, "has always been uppermost in my mind-that, and anger at the senseless, brutish things that were being done. I have felt bound by a solemn

in 1963

obligation to do what I couldif I didn't at least try I could never be happy again in nature. But now I can believe that I have at least helped a litbelieve one book could bring a complete change."

True, the damage being done by poison chemicals today is far worse than it was when she wrote the book. Yet one shudders to imagine how much more impoverished our habitat would be had Silent Spring not sounded the alarm. Well crafted, fearless and succinct, it remains her most celebrated book, although her wonderful essays on the sea may be remembered longer. Even if she had not inspired a generation of activists. Carson would prevail as one of the greatest nature writers in American letters.

Matthiessen's latest novel, Bone by Bone, is due out in April

#### JACQUES-YVES COUSTEAU: LORD OF THE DEPTHS

e was a sailor, explorer, inventor, best-selling author, prizewinning filmmaker, passionate environme and canny businessman. Instantly recognizable by his pipe, red cap and gaunt silhouette, Jacques-Yves Cousteau-a.k.a. "Captain Planet"-was arguably the century's best known, most popular Frenchman. For generations of scuba divers-and millions of armchair explorers-he created a crystal-clear window for the unseen world beneath the waves

Before Cousteau, undersea exploration was limited by the length of a human breath or the tether on a diving helmet. His co-invention of the Aqua-Lung in 1943 freed us to roam the ocean depths-like an 'archangel" flying through the heavens, as he put it. Maker of more than 150 films, beginning with his Oscar-winning The Silent World in 1956, Cousteau revealed a flotilla of wondrous creatures to an audience that was instantly entranced. In his last book. Man. Octopus and Orchid, published shortly after his death in 1997 at the age of 87. Cousteau summed up his long career with a powerful denunciation of ocean pollution, nuclear energy



HIS FILMS REVEALED AN ENDLESS ARRAY OF RAINBOW-COLORED CREATURES

his late-blooming commitment to their cause, and professional scientists questioned the credentials of this self-taught oceanographer, their carping paled next to Cousteau's

towering lifetime achievements-crowned by his induction into the prestigious French Academy in 1989 Born near Bordeaux in 1910. Cousteau had dreamed of a career as a French navy aviator until a near fatal automobile crash dashed those hopes-and serendipitously led him to his true vocation. Taking up

swimming to strengthen his broken arms, Cousteau fell in love with the sea. "Sometimes we are lucky enough to know that our lives have been changed, to discard the old, embrace the new, and run headlong down an immutable course," he later wrote, "It happened to me on that summer's day when my eyes were opened to the sea.

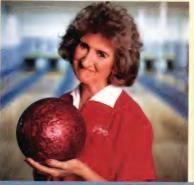
> 66-ft. minesweeper named Calypso and turned it into the floating oceanographic laboratory on which he would sail the seven seas for more than four decades. That legendary vessel sank after a freak accident in Singapore harbor in 1996; a state-of-the-art 217-ft. replacement. Calvoso II, is on the drawing board awaiting funding. But through the Coustea and which continues to operate under the direction of his widow Francine, Captain Planet's legacy lives on in the form of films,

In 1950 Cousteau acquired a retired

books and a thousand azure images etched indelibly on the mind. -By Thomas Sancton/Paris

THE AQUA-LUNG FREED DIVERS TO EXPLORE THE DEPTHS UNTETHERED

# Does the IRS OWE you? Or do YOU OWE the IRS?



Expecting a tax refund this year? IRS e-file is the fastest way to get your money back—in half the usual time. Even faster if you specify Direct Deposit to your bank account!

Or do you owe more tax? You can e-file now, get quick proof that your return is accepted—then wait until April 15th to pay.

IRS e-file offers you convenient payment options. One option allows you to authorize a withdrawal from your bank account on the date you choose, up to April 15th. Another option allows you to pay with your credit card.

IRS e-file is fast, simple and secure. So accurate, there's less chance you'll get a letter from the IRS.

For all the details, visit our Web site at www.irs.ustreas.gov or see your tax professional.



THE RESERVE AND ADDRESS OF THE PARTY OF THE



The State of THE WARREN - Da ... I den THE ROLL BUILDINGS ST SERBIMAN SEE! Y CP9 - 13/4 140 A STATE OF THE REAL PROPERTY. See Law Co. Law THE RESERVE 2 6 1 4 5 報告を注 1 TO adiate of First THE RESERVE TO Comment was THE REAL PROPERTY AND ADDRESS OF THE PERSON NAMED IN COLUMN TWO IN COLUMN TO THE PERSON NAMED IN COLUMN TWO IN COL and had at any or the Million Town Town Time Time A E per de En-Total Canada Can 1 3 21 m , 520 , 10 - - COM COME RESERVE THE REAL PROPERTY AND ALL DESCRIPTION OF REAL PROPERTY. 的自 學 器 科學 學 HARLING WATER THE AND DESCRIPTIONS OF PERSONS ASSESSMENT THE RESERVE THE PARTY OF THE PA · Sales Sale ment with the bestett THE RESIDENCE OF THE PARTY OF T The same was the same of THE RESIDENCE IN CO. LANS. TO THE PARTY OF THE PERSON When the Property THE RESERVE AND PERSONS ASSESSED. STATE OF THE PARTY A STREET BOOK TO SEE STATE OF THE PARTY OF TH SALES OF THE PARTY S THE RESERVE THE PARTY OF THE William I and the second of the WHAT AND THE PARTY OF THE PARTY THE RESERVE THE PARTY AND THE THE RESERVE OF THE PARTY OF THE THE RESERVE THE PARTY OF THE PA THE RESERVE THE PARTY OF THE PA DOMESTIC OF THE PARTY OF THE PA Ches Silv you College St. 5 Th Say IVI BY HE SEE MARRIED SEE SEP OF THE PARTY. 1-6-10 department of the same of THE RESERVE AND DESCRIPTION OF PERSONS AND STATE OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN CO AND THE REAL PROPERTY AND THE PARTY AND THE MININE SHAPE OF THE PARTY OF TH THE FIRST MARKET NO. 12 ...... THE RESERVE OF THE PARTY OF THE THE R. P. S. RESEARCH STREET, SAN LOSS AND ADDRESS OF THE PARTY AND ADD THE RESERVE TO SHARE THE PARTY OF THE PARTY THE STATE OF THE S THE RESERVE TO BE STORY THE PERSON NAMED IN COLUMN PERSONAL PROPERTY AND S Refer II II The print print the ATTENDED TO STATE OF THE PARTY H LAW MALLIES HES BALL TO SEE The second second

#### **NETWORK DESIGNER**

From the thousands of interconnected threads of the Internet, he wove the World Wide Web and created a mass medium for the 21st century

By JOSHUA QUITTNER

ant to see how much the world has changed in the past decade? Log on to the Internet, launch a search engine and type in the word enquire (British spelling please). You'll get about 30,000 hits. It turns out you can "enquire" about nearly anything online these days, from used Harley Davidsons for sale in Sydney, Australia ("Enquire about touring bikes. Click here!"), to computer-trainingby-e-mail courses in India ("Where excellence is not an

act but a habit"). Click once to go to a site in Nairobi and enquire about booking shuttle reservations there. Click again, and zip off to Singapore, to a company that specializes in "pet moving." Enquire about buying industrial-age nuts and bolts from "the Bolt Boys" in South Africa, or teddy bears in upstate New York. Exotic cigar labels! Tantric sex guides! Four-poster beds for dogs!

So what, you say? Everybody knows that with a mouse, a modem and access to the Internet, these days you can point-and-click anywhere on the planet, unencumbered by time or space or long-distance phone tariffs.

Ah, but scroll down the list far enough, hundreds of entries deep, and you'll find this hidden Rosebud of cyberspace: "Enquire Within Upon Every-

PICTURES OF 2,304 WEBSITES WERE COMBINED TO MAKE THIS PHOTO-MOSAIC OF BERNERS-LEE thing"-a nifty little computer program written nearly 20 years ago by a lowly software consultant named Tim Berners-Lee. Who knew then that from this modest hack would flow the civilization-altering, millionaire-spawning, information suckhole known as the World Wide Web?

Unlike so many of the inventions that have moved the world, this one truly was the work of one man. Thomas Edison got credit for the light bulb. but he had dozens of people in his lab working on it. William Shockley may have fathered the transistor, but two of his research scientists actually built it. And if there ever was a thing that was made by committee. the Internet-with its protocols and packet switching-is it. But the World Wide Web is Berners-Lee's alone. He designed it. He loosed it on the world. And he more than anyone else has

fought to keep it open, nonproprietary and free.

It started, of all places, in the Swiss Alps. The year was 1980. Berners-Lee, doing a sixmonth stint as a software engineer at CERN, the European Laboratory for Particle Physics. in Geneva, was noodling around with a way to organize his farflung notes. He had always been interested in programs that dealt with information in a "brain-like way" but that could improve upon that occasionally memory-constrained organ. So he devised a piece of software that could, as he put it, keep "track of all the random associations one comes across in real life and brains are supposed to be so good at remembering but sometimes mine wouldn't." He called it Enquire, short for Enquire Within Upon Everything, a Victorian-era encyclopedia he remembered from childhood. Building on ideas that were

add stuff that resided on someone else's computer? First he would need that person's permission, and then he would have to do the dreary work of adding the new material to a central database. An even better solution would be to open up his document-and his computer-to everyone and allow them to link their stuff to his. He could limit access to his col-

leagues at CERN, but why stop

current in software design at the time. Berners-Lee fashioned a kind of "hypertext" notebook. Words in a document could be "linked" to other files on Berners-Lee's computer: he could follow a link by number (there was no mouse to click back then) and automatically pull up its related document. It worked splendidly in its solipsistic, Only-On-My-Computer way. But what if he wanted to

there? Open it up to scientists THE WEBMASTER IN 1976, SOLDERING ONE OF HIS FIRST

BORN June 8, 1955, In: 1976 Graduates from een's College, Oxford 1980 White at CERN, writes "Enquire" 1989 Proposes global hypertext project called 1991 The Web debuts on 1993 University of Illinois 1994 Joins M.I.T. to c the W3 consortium

list of people to a phone book to an organizational chart to whatever."

o be cobbled together a relatively easyto-learn coding system HTML (HyperText Markup Language)-that has come to be the lingua franca of the Web; it's the way Web-content creators put those little colored, underlined links in their text, add images and so on. He designed an addressing scheme that gave each Web page a unique location, or URL (universal resource locator). And he hacked a set of rules that permitted these documents to be linked together on computers across the Internet. He called that set of rules HTTP

(HyperText Transfer Protocol). And on the seventh day, Berners-Lee cobbled together the World Wide Web's first (but not the last) browser. which allowed users anywhere to view his creation on their computer screen. In 1991 the World Wide Web debuted, instantly bringing order and clarity to the chaos that was cyberspace. From that moment on, the Web and the Internet grew as one, often at exponential rates. Within five years, the number of



#### If [computer networking] were a traditional science, Berners-Lee would win a Nobel Prize.

ERIC SCHMIDT, CEO of Novell

jumped from 600,000 to 40 million. At one point, it was doubling every 53 days.

Raised in London in the 1960s, Berners-Lee was the quintessential child of the computer age. His parents met while working on the Ferranti Mark I, the first computer sold commercially. They taught him to think unconventionally; he'd play games over the breakfast table with imaginary numbers (what's the square root of minus 4?). He made pretend computers out of cardboard boxes and five-hole paper tape and fell in love with electronics. Later, at Oxford, he built his own working electronic computer out of spare parts and a TV set. He also studied physics, which he thought would be a lovely compromise between math and electronics. "Physics was fun." he recalls. "And in fact a good preparation for creating a global system."

It's hard to overstate the impact of the global system he created. It's almost Guten-bergian. He took a powerful communications system that only the elite could use and turned it into a mass medium. "It this were a traditional science, Berners-Lee would win a Nobel Prize," Eric Schmidt, coto of Novell, once told the New York Firnes. "What he's done is that significant."

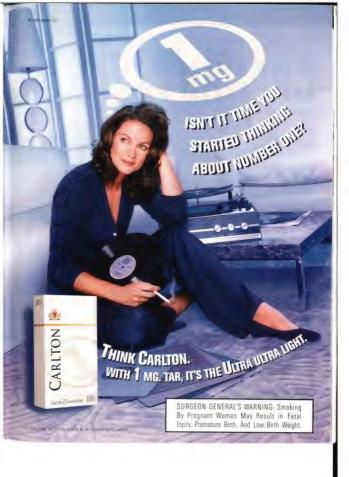
You'd think he would have at least got rich; he had plenty of opportunities. But at every iuncture. Berners-Lee chose the nonprofit road, both for himself and his creation. Marc Andreessen, who helped write the first popular Web browser, Mosaic-which, unlike the master's browser, put images and text in the same place, like pages in a magazine-went on to co-found Netscape and become one of the Web's first millionaires. Berners-Lee, by contrast, headed off in 1994 to an administrative and academic life at the Massachusetts Institute of Technology. From a sparse office at M.I.T., he directs the W3 Consortium, the standard-setting body that helps Netscape, Microsoft and anyone else agree on openly published protocols rather than hold one another back with proprietary technology. The rest of the world may be trying to cash in on the Web's phenomenal growth, but Berners-Lee is content to labor quietly in the background, ensuring that all of us can continue, well into the next century, to Enquire Within Upon Anything.

Joshua Quittner, TIME's Personal Technology columnist, is the new editor of TIME DIGITAL



#### VANNEVAR BUSH: HYPERTEXT PROPHET

annews Bush is an unisely cyberculture feeto, Arter 311, fee was properly and the differential properly and the properly ane



The century gave us scientific superstars like Freud and Einstein, but it also produced its share of ...

# CRANKS.

#### STANLEY PONS AND MARTIN FLEISCHMANN

Producing energy through nuclear fusion is easy enough to doprovided you have a reactor that can generate temperatures hotter than the sun's. If you could somehow achieve fusion at room temperature, you'd have an unlimited source of power that could retire petroleum, nuclear and solar energy for good.

reture pertinetum, nuclear ante soan clearly to good.

In 1989 chemists B. Stantopar Center Martin Fleischmann announced to great fanfare that they had done just that, building a bench-top fusion percolator made up of two electrodes and a slug of heavy water. But Pons and Fleischmann were vague about how their "cold fusion" reactors worked, and when other scientists when the production of the production o

tried to duplicate the pair's results, they got mostly cold water for their trouble.

The University of Utah, which held the patent on the process, allowed it to lapse, and cold fusion fell from view. Pons and Fleischmann repaired to Europe to continue their work—separately and quietly.



#### WILHELM REICH

Even by his field's indulgent standards, Reich was surely one for the casebooks. Brilliant and charismatic, the Austrian-born psychoanalyst was an early disciple of Freud and produced a shrewd addition to analytic theory: a patient's character, he

said, was revealed as much by booky language—muscular amounts, it is couch talk. Before long Reich split with Freud and went off on his own wobbly path, Atter dabbling with Marrism, he began theorizing about a universal life-giving 'cogone energy'—which, he said, was expressed through neurosis-free orgams. He fed to the U.S. and soon had followers like Norman Maller stitting naked in orgone accumulators to achieve 'organize potters,' wait of the component of th



# VILLAINS

#### TROFIM LYSENKO

He was Joseph Stalin's favorite scientist, and it's easy to see why. Lysenko was a peasurb-born agronomist and Marxist ideologue who rejected Mendel's ideas because they contradicted the doctrine of dialectical materialism. He offered instead to solve the Soviet Union's chronic crop failures through a process he called

vernalization, by which he would "train" spring wheat to be winter wheat and thus increase the number of annual harvests. Lysenko believed all living organisms passed on to succeeding generations charac-

teristics aequired in their lifetime. This untested theory was a todds with what Lysenko scathingly called "alien bourgoois genetics, but Soviet scientists who dared disagree risked being sent to the gulag. The cost was high. Even after Lysenko's final fall at the end of the Khrushchev era. Soviet agriculture continued to suffer. Worse still. Soviet scientists missed out on the genetics revolution. To this day, Russian biology lags behind that of the West, thanks to Cornade Lysenko.

#### JOSEF MENGELE

The Hippocratic oath keeps it simple, reminding physicians that first, they must do no harm. No one in medical history violated that canon with more murderous zeal than Germany's Dr. Mengele.

The son of a Bwarian at the Nazi Party in the 1930s and began The son of a Bwarian at the Nazi Party in the 1930s and began studying the sham seigne of "racial bygiene." In 1943 he be, came medical chief at Auselvivie. Sirkimanu, where he sent more than 400,000 non-Aryan prisoners to the gas chambers. On the side, he engaged in all manner of experimental butchey—dripping chemicals into prisoners' eyes to see if he could turn them a more Reich-plessing blue, exposing others to infectious diseases

to watch how different races respond to pathogens.

When the war ended, Mengele filed to South America. He died there in 1979 and was buried quietly under an assumed name. His remains were disinterred and identified in 1985—a too late bit of proof that even the \*Ubermenseh\* can come to an ignoble end.



# ... AND UNSUNG HEROES

#### ALFRED WEGENER

When he first proposed his heretical ideas early in the century, many geologists travea this German meteorologist as if he were at his German meteorologist as if he were member of the Flat Earth Society. Convinced that the continents were anchored firmly in place, geologists dismissed as preposterous his theory that the earth's major land masses had once been huddled together in a single supercontinent, which he called

Pangaea (Greek for "whole earth"), then began slowly drifting apart. Wegener had plenty of evidence, ranging from the jigsaw-like fit of the continents to the discovery of matching fossils on opposite sides of oceans, but he couldn't give a satisfactory explanation of what caused the global breakup.

For years continental drift was held up to derision—until scientists in the 1960s found a plausible mechanism in the earth's internal motions under the ocean floor. Suddenly, wegener's disreputable ideas became reputable. Henamed plate tectonics, they gave geology a single unifying theory, explaining everything from earthyndases and volcanoes to the function of mountain ranges and ocean basins. Sadly, and the sudden of the control of the

#### ELISABETH KUBLER-ROSS

For this Swiss-born psychiatrist, death was medicine's dirty secret. American doctors, she learned early on, rarely discussed the



subject with the terminally ill, and the idea of administering pain killers or letting patients die at home or with their families around them was almost unheard of Determined to overthrow this taboo, she interviewed hundreds of dying patients, sometimes in the presence of started medical students. Her best-selling 1969 book, On Death and Dying, detailed her now popularly accepted conclusions. The

dying, she wrote, go through five psychological stages: denial ("No, it won't happen"), anger ("Hym mer"), harganing ("God, just a little longer"), depression and finally acceptance. Lecturing and writing at a furious pace, she went on to campaign for hospice care in the U.S., gave countless "life, death and transition" workshops around the world and tried to help bakies with AIDS. Her current infatuation with mysticism and the afterlife distresses some in the psychiatric community. Even so, though hobbled by several strokes, Kübler-Ross, at 72, remains a powerful voice for the terminally ill and their loved ones.



#### **EUGENE SHOEMAKER**

The idea that a cornet or asteroid might be bearing down on Earth—six in Dev import and Armangdom—an be traced to this crusading geologist. Probing Arizona's Meteor Crater in 1956. Shoemaker found a form of quarter that is created only by tremendous impacts. Finding the same tellular mineral in other craters, the concluded that they had been formed not by volcanoes, as most scientists thought, but by large objects hitting Earth. It was only a natter of time, he said, before Earth, would be struck again. So he launched the first organized search for big incoming objects, refunding it. Even the public began to take notice year, in the Cornet Shoemaker-Levy 9 (which he co-discovered) crashed into Lupter in an awesome demonstration of what could happen here:

#### SRINIVASA RAMANUJAN

A minor bureaucrat in Madras, India, Bamanujan tried twice to interest professional mathematicism in his spar-time dabbling with numbers. All too familiar with numerological crackpost, hey were profoundly uninterested. But Ramanujan persisted, and his third shot was the lucky one. The eminent Cambridge on G.H. Hardy took the time to deeipher the young man's idiosyncratic serawis and realized he was corresponding with a genius. Unlike trained mathematicians, Ramanujan knew his

speculations about numbers were true, so he didn't bother to

prove them. That wouldn't do. Hardy brought him to England in 1914, and the pair spent four years working to prove the self-taught mathematician's intuitively brilliant conjectures. Alas. Hamanujan hated England and died of tuberculosis in 1920 at age 32—with so much of his opus left unproved that mathematicians today are still working on it. — By Frederic Golden, Leon Jaroll.

Jeffrey Kluger and Michael D. Lemonick

# Sometimes the greatest inventions are the ones with the most mundane uses. These ideas quickly found their way into everyday life **SCIENCE TO WORK**

#### MICROWAVE OVEN

Percy Spencer didn't know better than to bring candy with him into his microwave lab in 1946. When the American engineer, who was developing radar components for the Raytheon Corp., let his chocolate bar get too close to a piece of equipment, it turned into chocolate goo.

Cooking would never be the same. Within a year, Raytheon had introduced the first commercial microwave oven-a clunky, 750-lb. thing that required plumbing to prevent overheating but that managed nonetheless to do the job: heat food by electromagnetically stimulating the water, fat and

sugar molecules within it. It was 20 years before Amana introduced a household model, and even then consumersfearing everything from sterility to brain damage from the unfortunately named "Radarange"-gave the gadget a pass.

By 1975, however, microwave ovens outsold gas ones. Though better known for soggy potatoes than for culinary masterpieces, the microwave has no equal when it comes to reheating coffee or popping popcorn. By 1997, 90% of American households owned one.

## brid was introduced in south Asia in the mid-1960s, wheat yields there jumped 60%. Miracle strains of rice and other grains followed in short order, triggering a global green revolution that put the lie to Malthus' gloomy calculation. For his role in

helping stave off world starvation, Borlaug was awarded the

#### Nobel Prize for Peace in 1970. BIRTH CONTROL PILLS

Biologist Gregory Pincus had his hands full in 1950, when the Planned Parenthood organization gave him \$30,000 and told him to develop a contraceptive that was "harmless, entirely reliable, and aesthetically satisfactory to husband and wife." Within 10 years, however, Pincus and his colleagues delivered, inventing the drug that sparked the sexual revolution. Introduced in the U.S. in 1960, the birth control pill, known simply as the Pill, was an ovulation-suppressing mix of estrogen and progestin that was 99% effective.

Not surprisingly, the magic contraceptive bullet was an instant best seller. Within five years, 5 million women were taking it, a number that exploded over the next decade as baby boomers reached sexual maturity. Better formulations were soon developed to minimize the danger of blood clots and other worrisome side effects. But some health risks could not be foreseen, and as the 1980s dawned, bringing with it AIDS and a sharp increase in other sexually transmitted diseases, the smart

#### THE GREEN REVOLUTION

Two hundred years ago, the English economist Thomas Malthus calculated that the world's population would soon outstrip its food-growing capacity. What he didn't anticipate was Norman Borlaug. Working in Mexico from 1944 to 1960-long before the advent of modern biotechnology-the U.S. biologist developed a hybrid strain of wheat that was enormously more prolific than its natural cousins. Borlaug's "miracle wheat" allowed Mexico to triple its grain production in a matter of years, and when his hy-

new sexual freedom that the Pill permitted started to seem not so smart. As a result, the humble condom made a comeback in the '90s As did abstinence

The Pill and such newer, longer-lasting variants as the Norplant implant and the Depo-Provera injection do endure, however, still-effective survivors of a revolution that seems to be winding down.

It was one thing for engineers at the start of the century to dream of filling the skies with airplanes and the roads with cars. It was another thing to figure out how to keep all that traffic straight. The solution turned out to be radar, an application of electromagnetic radiation that forever changed the nature of travel, warfare and even space exploration. In the early 1900s engineers first appreciated how easily ra-

dio waves can be bounced off almost any object. In 1925 physicists took advantage of this, firing signals at the ionosphere and using the reflection to measure its altitude. By World War II. British scientists had refined the technology, and the government began to dot the coast of England with civil-defense radar stations. As the hardware got simpler, radar found its way into airplanes, boats and air-traffic-control towers, improving navigation and ensuring that even a cow-pasture airport could operate safely. By the end of the century, the same basic technology was being used to steer spacecraft, track storms and help police catch speeders-proof that even the most arcane science can pay very pedestrian dividends



What good is a brilliantly intense, tightly focused beam of light? It can make a dandy weapon or torture device, as Sean Connery found to his dismay in the James Bond film Goldfinger. But while laser weaponry never really took off, lasers certainly did. Today they are used for among other things, dentists' drills and delicate eve surgery, recording and playing back compact discs, measuring the distance to the moon, creating and viewing holograms, industrial cutting and welding, sending voices and data through the air and down optical fibers, surveying roads and building sites, generating energy in controllednuclear-fusion experiments. "painting" dots on a drum in laser printers and as high-tech pointers in lecture halls. The military, however, hasn't given up trying to make the

laser into a weapon. Ronald Reagan's ill-fated Star Wars program called for orbiting X-ray lasers to zap enemy missiles, and the Army is still experimenting with battlefield lasers. While they won't slice enemy soldiers in half, they can temporarily blind troops.

#### INSTANT PHOTOGRAPHY

Edwin Land had long since dropped out of Harvard, founded a successful corporation and come up with scores of inventions when he took on the challenge of instant photography just after World War II. Until then, photographers had to develop their film and then print it on paper-or send it off to a professional lab-before they actually had a picture in hand. Land was convinced he could shortcut this laborious process by creating a camera that did all the work itself, and by 1947 he had done it. Instead of conventional film, the Polaroid Land Camera was loaded with photographic paper coated with a paste of light sensitive chemicals. A mere 60 sec. after the photograph er tripped the shutter, out popped a snapshot. The first Polaroids were black-and-white; the company introduced color in 1963.

Land's invention added a new dimen sion to photography. but for him it was just scientific journey. He went on to do basic research on vision and came up with important insights into how the brain perceives

color. -By Jeffrey Kluster and Michael D. Lemonick



A master of the genre contends that it boasts an impressive predictive track record—if you squint hard and ignore most of the evidence

By BRUCE STERLING

cience fiction is a native 20th century art form that came of age at the same time as jazz. Like jazz, science fiction is very street-level, very American, rather sleazy, rather popular, with a long

and somewhat recondite tradition It's also impossible to avoid, no matter how hard you try.

Science fiction boasts an impressive predictive track record—if you squint hard and ignore most of the evidence. Atom bombs, space-oraf, comasts, reciti cards, jukeboxes, waterbeds, gene splicing—they all appeared in science fiction first, well before showing up at the mall or on the military base. But science fiction is visionary by design and prophetic only by accident. You'll have a hard time finding, androids, aliens, time travelers or psyichip powers at the K-mart, even though science-fiction writers have objected.

The U.S. Congress's Office of Technology Assessment had all the

Technology / THE MAIDEN IN PERIL IS A STAPLE OF SCI-FI B MOVIES ssessment had all the virtues sometimes claimed for science fiction. The ora was concerned with genuine hard-core technological prediction. It paid close scholarly attention to technical

trends and their social implications with facts, figures and footnotes—and Congress abolished it in the mid-1990s. The OTA didn't work out: science fiction suits us better.

> American society prefers having supergizmos dropped on its head out of nowhere, with no time to prepare and no real thought of the consequences. We love it that way, It's livelier, funnier, freer and just more American.
> "Leap, and the net

will appear!"

If science fiction outlived the OTA, it also gets more girls, gold and glory than its other big rival, professional corporate futurology. Corporate trend spotting, after all, is limited to

gizmos that might conceivably make someone money. Science fiction, in its sleep and entirely by accident, makes absurd amounts of money: SF films, comie books, action figures, CD-ROMS, computer games, chrome cards, costumes—there's no end to it.

there's no end to it.
Science fiction is a funhouse mirror for a societywarped by raging technological advance. Science fiction doesn't want or need to make much sense. It seeks astonishment, terror, wonder, ecstasy and dread. It is spectacular and myth-

ic, an oxygen tent for society's daydreams. Science fiction cordially ignores many vital technologies, such as, say,

garbage recycling. Recycling is hugely important, but it has zero science-fictional thrill.

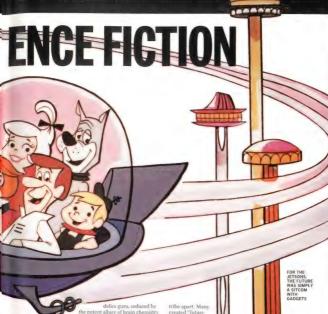
has zero science-netional thrill.

SF's sag of the techno-sublime is about power, speed and transcendence of human limits. Ray guns, starships, artificial intelligence, virtual reality, nanotechnology—all beloved of SF, and every last one of them a big Technicolor disruption of the mundane.

disruption of the mundame. When science fiction gets over its trite romance with the parts estable, it claim and the parts of the parts

WONDER

Manual Action of the Manual Control of the Action of the Control of the Action of the



Orwell holds the world record for scaring us away from a future that seemed perfectly plausible. People like to claim that Orwell "got it wrong," as if it were Orwell's fault that we don't dwell in some ghastly dystopia. His 1984 (published in 1949) is the bitter work of a dying man. Granted, political correctness and language theory haven't become Newspeak just yet. But Orwell's portrait of a debased Britain, singing machine-made pop songs and obsessed with vast public lotteries, has a certain uneasy resonance even now.

On the grim subject of networked surveillance, maybe Orwell was just a big, mean, bring-down pessimist. On the other hand, we haven't yet seen an Internet society in the grip of a genocidal land war. Security videocams are already ubiquitous; they've become too commonplace for fiction to notice

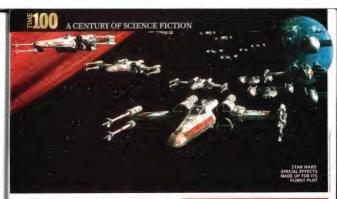
Huxley and Orwell, of course, didn't think of themselves as science-fiction writers. The true artists of the genre are a

created "future histories" that are

worked out in exquisite detail. Robert A. Heinlein, for instance, was a hugely popular SF writer but of a surprisingly gloomy and gothic cast. His prediction for the late 20th century was summed up briskly: "Considerable technical advance during this period, accompanied by a gradual deterioration of mores. orientation and social institutions, terminating in mass psychosis." It was hard to watch the Clinton impeachment trial without feeling ol' Bob was on to something

Heinlein also forecast a 21st century America seized by evil right-wing Christian fundamentalists plugged into cunning propaganda networks. These way-out notions of Heinlein's were composed in the 1940s; he probably thought he was being very provocative, out there and outrageous.

Time has been less kind to other works of SF, despite hard work and serious intent. Harry Harrison's novel Make Room!



Make Room! (source of the movie Soylent Green) predicted a New York City crammed with 35 million people, each allotted a meager four square yards of living space. That novel is set today-in 1999. It was published in 1966. The scenario made sense back then, before the advent of widespread birth control. All you had to do was follow the exponential curves.

If the tag end of the century resembles the work of any single SF writer, it must surely be J.G. Ballard. One might make an argument for the prescience of William Burroughs (if you're a junkie) or the uncanny knack of William Gibson (if you're a career computer criminal). But Ballard is surely the most insightful artist the genre ever produced. While most SF writers of his generation were down at the Jet Propulsion Laboratory cheering on the moon landings. Ballard was in a London art gallery throwing a Pop Art happening with a crashed car and a topless model. Ballard's approach to the future was never rooted in engineering, physics or

rather in medicine, psychology and Surrealism Time has been

kind to him Ballard was the first SF writer to realize that there was something basically lunatic about space travel. Ballard never pre-

dicted events or devices: instead. NBC AXED THE FIRST STAR FANS CLAMORED FOR MORE

he described future sensibilities how it might feel, what it might mean. A bizarre contemporary event like the paparazzi carcrash death of Princess Diana is perfectly Ballardian. No flow chart, no equation, no profit projection could ever have predicted that, but if you've read Ballard, you swiftly recognize the smell of it. I daresay that's the best the SF genre will ever do-and no more should ever be asked of it.

Science-fiction writer Bruce Sterling has published 12 books His seventh novel, Distraction, was released in December

#### WHAT THE EXPERTS PREDICTED

"Everything that can be invented has been invented. -Charles Duell, head of the U.S. Patent Office, 1899 "X rays are a hoax."

MARTIANS BUILD TWO IMMENSE CANALS IN TWO YEARS -New York Times headline,

Aug. 27, 1911 "The chemical purity of the air is of no importance." -L. Erskine Hill, lecturer in

rysiology at London Hospital, "The radio craze

will die out in time." -Thomas "While theoret ically and techni-

cally television may be feasible, commercially and financially I consider it an impossibility." -Lee DeForest,

inventor of the Audion tube. "(By 1940) the relativity theory will be considered a joke." —George Francis Gilette

American engineer, 1929 "50 years hence ... [we] shall escape the absurdity of growing a whole chicken in rder to eat the breast or wing by growing these parts separately

under a suitable

"I think there is a world market for about five computers." -Thomas Wats chairman of IBM.

will never go off, and I speak as an expert in explosives." -Ad William Daniel Leahy advising President Truman o the U.S. atom-bomb project.

"The Bomb

"Space travel is utter bilge." -Richard van der Riet Wooley, on assuming the post of British Astronomer Royal

1956 "There is no reason for any individual to

computer in their home. -Ken Olson president of Digital

Equipment Corp., 1977 "640K [of memory] ought

to be enough for anybody. -Bill Gates CFO of Microsoft 1981

"The cloning of mammals ... is biologically impossible. -James McGrath and Davor Solter, writing in Science, Dec. 14, 1984

From The Experts Speak by Christopher Cerl and Victor

Plastic soft drink bottles have been simming down for years. Take today's popular two-lifer bottles. They'e 27% lighter than they were in 1990, but still as stong and shatter-resistant as ever. And, these leaner plastic bottles reduce the need for millions of pounds of packaging, helping to conserve precious natural resources. To learn more about the benefits of plastic packaging and our environment, contact the American Plastics Council at www.plastics.org or 1-800-2-HELP-90.



PLASTICS MAKE IT POSSIBLE.

# 1.800.32SMART way to get

LOWER MONTHLY Payments on a swell new but vehicle is with SMARTLEASE by GMRC. 30% Lower (405!) Than if you purchased it with a Bank Loan. Or just puromore or niftier Vetticle For the money.

Are FOLKS (1) CALL The FOLKS @

www.gmacfs.com

C and get the skinny

# WHAT'S NEXT? The pace of discovery is likely to accelerate, says the former editor of Nature



#### By SIR JOHN MADDOX

ne thing is certain about the century (or even the millennium) ahead. The pace of discovery is sure to be even faster than it is today and the social and ethical dilemmas created by the exploitation of new knowledge even more haunting. Our understanding of the world has deepened at an accelerating rate since the beginning of modern science 500 years ago. Our century, for example, has had the wit to ask how the universe is constructed, how even the tiniest particles of matter move and how life manages to exist in the face of all the odds against it.

Our century has also turned science into the principal agent of technology. When James Watt built the first steam engines 200 years ago, he had intuition but not the laws of thermodynamics to guide him. We do not sufficiently applaud our century's discovery that science can be useful-or the degree to which science has come to depend on technology for its new instruments: powerful telescopes, atom smashers, computers.

The 20th century has made science more exacting. We demand more of its explanations. To say that the earth goes around the sun is no longer sufficient; we insist on knowing why. And in some fields-space research, for example-decades can go by while novel instruments are designed and built. A further complication is that every discovery provokes new questions. The more we know, the more we do not know.

To predict what lies ahead, we must often rely on guesswork But the nature of our present ignorance points to problems science cannot avoid. The most obvious of these is the question of what happens in our head when we are thinking. Nobody yet has a compelling answer for that. People surmise, but no surmise can yet meet the tyrannical test that every assertion about the nature of the world must be proved by experiment or observation. Here, then, despite the dangers, is a checklist of some of the

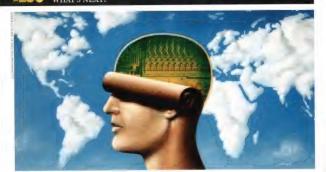
scientific and philosophical challenges for the century ahead:

#### HUMAN EVOLUTION

Human beings and the great apes had a common ancestor about 5 million years ago. The genes of the two groups differ hardly at all, but some of them are differently arranged. By using that information, along with hominid fossils, we shall learn what genetic changes made it possible for the ancestors of modern people to stand upright (about 4 million years ago) and then to speak. As a by-product, we shall be able to trace the migration routes of our human ancestors who emigrated from Africa and came to populate the surface of the earth. A half-century from now, we shall have a rich and authentic history of the human race.

#### LIFE'S BEGINNING

How life began is a grander question that will occupy most of the next century. The first task is to reconstruct the history of evolution over the past 4 billion years. Modern gene technology



can use the DNA in every living thing as a vast repository of historical information. Even DNA will not point all the way back to the beginning of life, but it will provide clues to the selfreplicating entities first assembled from simple chemicals on the primeval earth. The century ahead will see the first laboratory proof that self-replicating systems an form from ordinary chemicals. Determining whether that is how life really began will take longer.

#### UNDERSTANDING LIFE

Figuring out how the chemical operations essential for survival are carried out within every cell of living restures (people included) is a task dominated by complexity. The Human Genome Project aims to specify the location and structure of all 100,000 or so genes in the human body. But that catalog, which understanding what all the genes do. Only when the network of their interactions with one another has been mapped will enduring benefits follow: in the survive redsign of drugs, in the growth of replacement organs, in the early detection and treatment of many kinds of diseases, including cancer. Only then shall we understanding which of the control of early life by the interaction of generative win the course of early life by the interaction of generative win the course of early life by the interaction of generative and environmental influences.

#### THINKING

How the brain manages to think is a conundrum with a millennaid time scale. All animals have brains so as to be able to move about. Signals from the sensers—eyes, ears, nostrils or skin, as the case may be—send messages to the spinal cord, which moves the limbs appropriately. But thinking involves the consideration of alternative responses, many of which have not been experienced but have been merely imagined. The faculty of being conscious of what is going on in the head is an extra puzzle. A century from now, electronics shops for websites) will be advertising all kinds of gadgest that simulate some the stranges of the human brain, but neuroscientists will still be struggling to understand the thinking machine in all our heads.

#### A THEORY OF EVERYTHING

Only 70 years ago, the universe was found to be expanding, but now there is a model of how it began: the Big Bang. At the beginning, it is said, there was literally nothing: If the void" of Genesis), not even space. Then there came into being a tiny speek of superheaded space that contained enough energy to create all the stars and galaxies that fill the sky-with enough left over to drive the expansion of the universe ever since.

One of the intellectual triumphs of our century, which stems from what is called quantum physics, is the understanding of how very high temperatures can create matter. Temperature is inseparable from regulation. Even in empty space, radiation has energy, and thanks to Einstein's special theory of relativity we know that energy is equivalent to mas, or matter. Laboratory scientists have been furnity end that process, turning mass into energy, makes maclear to make it is a contraction of the process, turning mass into energy, makes nuclear forms.

There as omething, versus, however, with this account of how the universe began. There is not nearly enough matter in the universe began. There is not nearly enough matter in the universe to match the predictions of the Big Bang, and our current list of the particles of matter is almost certainly incomplete. We need a more sophisticated view of what is meant by "empty space," which turns out not to be empty at all. There are also serious philosophical problems created by the Big Bang, which can be described but not explained. Worse, nadoob has been a subcan be described to that of explained. Worse, nadoob has been a contract physics. Einstein's theory of gravitation. Until that is done, the true nature of our universe well remain beyond our the

So must we enter the new century in a state of ignorance? There is no shame in that. All previous centuries have been justly proud of their schievements, yet those have been found, in retrospect, to be deficient. We must learn to be patient. We should also discard the idea that scientific inquiry will ever be complete. What we know so far is that each question answered merely spawns another. Why should it not be like that for the rest of time?

Sir John Maddox is the author of What Remains to Be Discovered









## Spend three nights bet a free" at Days Inns.

Video

Now when you spend any three nights at Days Inns, between February 15, 1999 and May 15, 1999, you get one night at the movies! Take your pick from eight great videos - Apollo 13. Junior and more! There's bound to be a video the whole family will enjoy. And with over 1800 Days Inn locations, there's bound to be a Days Inn hotel wherever you're headed. For reservations, call 1-800-DAYS INN® or visit us at www.daysinn.com.

## DAYSINN There you go!SM

MetLife Days Inns and MetLife are pleased to also provide you with a free copy of the Life Advice Directory of Topics with your free video.





Modernists once dismissed John Singer Sargent's society portraits. They were wrong

# **A True Visual** Sensualist

By ROBERT HUGHES

OHN SINGER SARGENT (1856-1925) was the last great society portraitistthe Van Dyck of his time, as Auguste Rodin was the first to say. Twenty years ago, to confess an admiration (however sneaking) for his work was to invite incredulity. Sargent? That flatterer of the Edwardian rich? That fat-cat holdover, that facile topographer of the social Alps, that living irrelevance to the concerns of modernism? But what goes around comes around. Sargent's reputation is back as though it had never gone away. Once again, if one can judge from the attendance at the Sargent show at the National Gallery of Art in Washington (through May 31, and then through the summer at the Museum of Fine Arts in Boston), he has a big public. Are its crowded galleries just another symptom of the explosion in the size of the public for U.S. museums? Or is there a new audience out there for the pictorial virtuosity Sargent represents? The latter, one hopes, but it's hard to tell.

The show bills itself as the first "complete" Sargent retrospective, which in a way it is-the Whitney Museum of American Art's attempt at one in 1986 was smaller and less intelligently planned, and this one does full justice to Sargent's watercolors, an essential side of his work. In fact there probably can never be a complete Sargent show, because his enormous early masterpiece, El Jaleo, 1882, cannot leave the Isabella Stewart Gardner Museum in Boston. But this is

the best look at him in living memory Sargent was an American artist. With

his older contemporary James Whistler, he was the first American painter since Benjamin West to become famous in England-and in France too. But he never set foot in the U.S. until his 21st year, and only rarely thereafter. The skeptic might say he hardly even qualified as an expatriate. As a boy he had no patria beyond the rented flat and the hotel room, and thus was unencumbered by the tension of nostalgia for early belonging that affects the real expat.

He was born in Florence, the son of intensely Europhile parents (his father was a New England doctor, his mother a clinging neurasthenic who couldn't bear the crude culture of her birthplace). The Sargents were not rich but they moved from one roost to another-Rome, Paris, Nice, Munich, Venice, the Austrian Tyrol-for the first 18 years of their son's life. All he retained of America was his passport and some traces of accent; yet he held onto both until his death, Sargent's relation to America was neither resentful nor yearning, as it is with so many expatriates. He was a cosmopolitan, with the perfect adaptability of

that type. His homeland was his talent It was fostered by training in Paris in the 1870s, at the teaching atelier of Emile Carolus-Duran. Very much the maestro and dandy. Carolus-Duran fo-

ENA AND BETTY, DAUGHTERS OF ASHER AND MRS. WERTHEIMER

1901







TWO GIRLS IN WHITE DRESSES CIRCA 1909-11

cused his method on a near monomaniae attention to direct tonal painting, almost the opposite of color-based Impression-"Velázguez, Velázguez, Velázguez," he intoned, "ceaselessly study Velázquez. And from that study, Sargent got three of the major traits of his style. The first was a consummate skill in rendering objects and people bathed in space and low light. The second was its apparent straightforwardness-its ability to make a gesture count, to "knock in" the folds of a black dress or the petals of a white rose with the utmost economy. And the third was a sense of pictorial decorum, the artist's refusal to parade his feelings. With Velázquez, you always know what he was seeing; what he was feeling, never. So with Sargent.

The lessons of Velázquez's Las Meninas, which Sargent had copied in the Prado, sank very deep into his style and would produce curious effects tinged with melancholy, like the brilliant early portrait of the daughters of Edward Darley Boit-four slightly alienated-looking moppets, their white pinafores gleaming in a cavern of bourgeois shadow.

By the end of the 1870s Sargent was shaping up for a glittering Parisian career It was not to last. The curators of the National Gallery show. Richard Ormond and Elaine Kilmurray, have wittily duplicated the hanging of two portraits that, seen

at the Paris Salon of 1884, caused a ruckus that precipitated Sargent's departure from France to England. One is his image of a pushy American social locomotive, Virginio Gautreau, all twisting, mannered pose and lunar, greenishwhite skin, identified only as Madame X The French critics

and public hated itand her. The other is a painting of a fashionable gynecologist named Dr. Samuel Pozzi. renowned in Paris for his exquisite tastes and the breadth of his affairs, including one with Mme. Gautreau. He rises before one's eves in a

LORD RIBBLESDALE

1902

with a velvet curtain behind him, one hand on his breast, looking like some 16th-arrondissement Don Giovanni protesting the sincerity of his intentions. The pairing of the New Orleans siren and her reputed lover set off a frenzy of gossip, and Sargent, more than a little unnerved, presently decamped to London.

England made his fortune. He was what the English upper classes-both hereditary aristocrats and nouveau riche -had wanted but not found: a portraitist who could perform in the Grand Manner. There had been none since the death of Thomas Gainsborough a century before. and Sargent, with his tremendous fluency and genuine empathy for the social levels of his sitters, filled the gap to perfection. He had no interest in politics past or present, was completely without class resentment and seemed to be devoid of irony. As a biographer who knew him pointed out. "He would have been puzzled to answer if he had been asked how nine-tenths of the population lived; he would have been dumbfounded if asked how they were governed.

This gave him the best possible qualification for painting the great and the good. He simply took them at their own valuation, producing vivid epitomes of social standing as he did so. His portrait of Lord Ribblesdale, for instance, remains the definitive image of the late-Victorian equestrian male: superbly grave and self-

contained, tall as a tree, and yet with a touch of carelessness in the flare of his buff hunting waistcoat and the dashing arabesque of paint with which, in a single loaded stroke, Sargent conveyed the fold of his breeches-a gesture as assured, in its way, as any brushstroke by de Kooning, With

women Sargent was in his ele-

ment, and icons of late-Victorian and Edwardian femininity rise from his work with wonderful directness: those all-timechampion lewish princesses the Wertheimer sisters, zaftig and bursting with life, or the paler and more shadowed beauty of Lady Agnew of Lochnaw.

As far as anyone knows, Sargent never had-or was even rumored to have

The artist created vivid epitomes of social standing

had-a sexual relationship in his whole life: nor did he ever do a painting of a nude. His sensuality was wholly visual and confined to the surface of things-the confused glitter of light on a Venetian canal, the rumplings of fabric, the porcelain skin of an upper-class face. The sexiest picture in this show is Two Girls in White Dresses. circa 1909-11. (It is actually one girl, his niece, painted twice, lying on an Alpine hillside.) Except for the faces, not an inch of skin is visible. They are completely swaddled in cotton and cashmere, but the agitation of the cloth into powerful folds and hollows, together with the passivity of the poses, gives the image a disconcerting

sensuality-not striptease, but layer-tease.

Nevertheless, the incessant production of highly paid portraiture began to chafe on Sargent. Clients kept interfering, pestering him to take this out and paint that in. "It seems there is a little something wrong with the mouth!" he complained to one of his sitters, about the demands of another. "A portrait is a painting with a little something wrong about the mouth!" In 1907, at the age of only 51, Sargent decided to give up doing paughtraits," as he disparagingly called them-except for those commissions he couldn't refuse, like a 1917 portrait of John D. Rockefeller. Sargent wanted to travel more and do landscapes, especially in watercolor-and next only to Winslow Homer, he was the finest American watercolorist of his time

He also had ambitions as a monumental painter, which resulted in a set of weird murals—Pre-Raphaelite throwbacks with overtones of realist modeling—depicting The Triumph of Beligion for the Boston Public Library, But Sargent the public artist was never much good. His big commissioned war painting, Cassed, 1919, is full of compassion and even nobility but is dead as mutton.

It's the smaller, more private works that really count, and in them it's Sargent's skill that gets you (almost) every time. True-blue modernists liked to call it "empty virtuosity"-in their book, virtuosity itself smelled of emptiness anyway; works of art had to be gritty and sincere and full of doubt, in homage to Papa Cézanne. But some kinds of virtuosity are deliciously full: they are self-delighting in their reluctance to turn every stroke of paint into the residue of a moral struggle that may not have really happened; they make difficult performance look easy, and give weight to casualness. Sargent was that kind of painter, and it seems pointless to rebuke him for it-especially at the end of a century whose art he did not for a moment aspire to change.

## **The Future Never Came**

Blur's new album, 13, has an experimental spirit but no focus amid all its electronica distortions



few sights are more forlorn than an old sei-film whose predictions of the future have, with the passing of time, been proved incorrect. We watch the flying cars, the ro-

botic dogs, the pills that expand with a drop of water into seven-course meals and think: "This future's already past. This film was set in 1990, it's 1999 already, and none of this has happened." It's a fate worse than simply being dated. Films set in the hippie '80s or the greedy '80s will always have a time and place, furtistic failures belong nowhere, residing in neither the future nor the past but in an era that never happened.

33, the electronics-powered new album from the British rock band Blur, resides in precisely that sort of timeless limbo. Not timeless in a positive sense, in the way that, say, Jimi Hendrúx's Arr You Experiencedê's its meless, but in the that the old szi-fi series Space: 1999 is now timeless. The series was about mon's being blown out of Earth orbit and traveling the universe. It's 1999 and our moon is still firmly in place. There's no reason to wealth that series a number

Blur's last album, the eponymous Blur (1997), featured raw, guitar-driven rock and seemed to be influenced by the then dominant alternative-rock scene in America. On 13. Blur's sixth album, the band has enlisted producer William Orbit, recent album, Ray of Light. The result is that 13 is full of buzzing and whirming, guitar distortion and machine-generated beats. Unlike on Madonna's album, however, few of the songs here have danceable rhythms, and few have memorable tunes. Other British acts, including Radiohead and UNKLE, have explored similar sort territory with more interesting results.

The songs on 13 have a sketchy, firsttake feeling to them. On another album, this might be a good thing; it might transmit to the listener a sense of improvisatory immediacy. But here it evokes mostly confusion, as if the band hadn't quite worked out exactly how it wanted to sound and what it wanted to say.

13 does have scattered moments of glory. The opening cut, Tender, is one of the album's best; it's an unexpectedly openhearted pop anthem, buoyed by a gospel chorus. Another standout song is Coffee & TV, a mellow, midtempo rocker. Blur can be a painfully smart band, and in these few songs, we come into palpable contact with its restless intelligence. However, much of the rest of the album is unfocused and fuzzy. Reportedly, some of this album was inspired by lead singer Damon Albarn's breakup with his longtime girlfriend, Justine Frischmann of the group Elastica. "It's over-I knew it would end this way," go the lyrics of one song, the bruised ballad No Distance Left to Run. This album's vision is clouded by pain. The future usually looks bleak after -By Christopher John Farley



210

















ire information, contact the Singapore in Board at 1:800-944-8778 or visit



Gertrude Stein by George Platt Lynes (American, born 1907) TIME cover portrait September 11, 1933 Gelatin silver print

featured avant-garde writers. To accentuate the departure, the editors ran a photograph rather than an illustration on the cover. The photographer was a young American, George Platt Lynes, who took the picture at Stein's retreat in Bilignin, France. Outlined against a classic Mediterranean background of mountains and pines, her close-cropped hair and strong features posed in profile, the author might be a noble Roman surveying an outpost of the Empire. Like Stein and the other American artists who flocked

to France before and after World War I, George Platt Lynes sought freedom and inspiration in Europe. His goal was to be a writer, and when he was introduced into Stein's famous Paris salon, he struck up a friendship with the author. But Lynes gradually turned away from writing and concentrated on

photography. By 1932 his portraits of such luminaries as Colette, Andre Gide and Igor Stravinsky were so highly regarded that he was invited to exhibit them at a new institution in New York City, the Museum of Modern Art. Lynes was only 25 at the time. He went on to enjoy great success as a photographer for prominent fashion magazines; later, working with George Balanchine and Lincoln Kirstein, he helped pioneer the specialized field of dance photography.

> The National Portrait Gallery presents FACES OF TIME Traveling Exhibition Schedule

Chicago Historical Society, Chicago, IL February 6 - May 16, 1999

Jimmy Carter Library, Atlanta, GA June 19 - September 7, 1999

Ronald Reagan Library, Simi Valley, CA October 23, 1999 - January 16, 2000

. This exhibition is sponsored by





Our color baser copiers and printers reproduce subtle colors perfectly on any network — even a color as chiswe as trust. It's what has set us apart since we introduced laser color eleven years ago. Canon Laser Color, Its only competition is reality.







#### Alas, a Painful Turn in Larroquette's Career

JOHN LARROQUETTE'S CHARACTER IS named Royal Payne. He works at a hotel that is called "A Payne Inn." You need no more information to form an opinion about this show

A remake of John Cleese's classic '70s British sitcom, Fawlty Towers, Payne (Wednesday, 8 p.m. E.T., CBS) stars Larroquette as a cranky, stingy hotelier undermined by his dominating wife (JoBeth Williams) and his own incompetence. If Payne serves any purpose at all, it's to show what a genius Cleese is. In the wrong hands the characters are badly drawn cartoons, the jokes offensive stereotypes and the plots a bad cross of the Keystone Kops and Three's Company. Sure, Fawlty Towers was also based on silly misunderstandings and coincidences, but it carefully built toward a



The star and Williams, as his wife, fall flat in their remake of Fawity Towers

manic, slapstick conclusion. In the original show you felt bad about laughing at the mistreated bellboy's broken English; now you just feel bad

In the past Larroquette has excelled at showing the depth of irredeemable characters, but here he plays a onedimensional villain, and he lacks the comedic skill to pull it off. Though to be fair, Charlie Chaplin couldn't pull off these jokes. Larroquette's last show at least aimed for smarter laughs-and got script suggestions faxed in from Thomas Pynchon. It's unlikely he will make any for Paune. If he does, he'd better submit them within the next few weeks. -By Joel Stein



#### IT'S LIKE. YOU KNOW .. It's Like Pretty Funny

THERE ISN'T MUCH LEFT TO PICK OVER when making fun of Los Angeles, but Peter Mehlman, a former co-executive producer at Seinfeld, goes deep enough into the vapidity of the Left Coast to make the subject fresh again. A magazine writer who moved from New York City to L.A. to write for television, Mehlman has created a show about a magazine writer who moves from New York to L.A. to write a book. And, though he can check out any time he likes, he never leaves

It's Like, You Know ... (Wednesday, 8:30 p.m. E.T., ABC) digs into the quirks of L.A.: the obsession with celebrities'

cars, the predominance of Harvard grads in the TV-writing business, the fascination with live police-ear chases. Chris Eigeman (the cocky guy in Whit Stillman films) underplays the New Yorker perfectly, avoiding the overly neurotic. And in what may be the bravest turn ever, Jennifer Grey plays herself, with lots of jokes about her nose job, past boyfriends and desperate desire to be recognized.

Though the pacing is entirely different from Seinfeld's (and not quite right yet), It's Like, You Know ... does rely on the same banter and wordplay, and it does it almost as well. Eventually, this series may resort to making earthquake jokes and doing bits about the smog, but until then, it is a very smart, knowing take on Los Angeles.

THE NORM SHOW

#### **Macdonald Buys the Comedy Farm**

MAYBE DON OHLMEYER WAS RIGHT. EVEN THOUGH NORM MAC donald was funny on Saturday Night Live and is great when guesting on Howard Stern or David Letterman, it turns out the guy isn't always so entertaining. After Ohlmeyer, NBC's West Coast president, fired him from the anchor desk at SNL's "Weekend Update" last year, Macdonald made the disastrous film Dirty Work. And now this On The Norm Show (Wednesday, 9:30 p.m. E.T., ABC), Macdon

ald, in the least likely scenario since Manimal, plays an exhockey player who is avoiding jail by paying off a community service sentence as a social worker. While Macdonald is often amusing, the sitcom never rises above mediocrity. The problem, besides the premise, is that Macdonald's sharp sarcasm may be a bit much over half an hour.

Laurie Metcalf (Roseanne) plays Norm's former social worker who now has to work side by side with this incorrigible slacker. She does well enough, but is stuck with little more to do than yell, "Oh, Norm!" at the appropriate times. The two, no doubt, will learn a valuable lesson from each other every week

If Macdonald finds the right vehicle, he can stil prove Ohlmever wrong. This just isn't it.



CINEMA

# **Famous for Being Famous**

#### Now this actor can be famous for being good

LL RIGHT. AFTER THREE YEARS OF hype, hokum and ho-hum, we finally get it: Matthew McConaughey has star quality. We weren't so sure back when McConaughey was in every other film and on every other magazine cover. His summer-of-'96 double whammy, A Time to Kill and Lone Star. gave evidence of a gritty, ingratiating talent. But he looked lost amid the more seasoned actors in Amistad, and no one could have brought to sensible life the woozy guru he played in Contact. It seemed as if McConaughey might lapse into ex-hunk obscurity, like those slightly too-good-looking fellows spotted behind a counter at a California video store.

That's where Ed Pekurny, the guy McConaughev plays in the new Ron Howard comedy EDtv. works when he isn't tossing one back with his rakehell brother Ray (Woody Harrelson) or refereeing battles at home in a blue-collar section of San Francisco. Ed is apparently at ease in a bizarre family and unthinkingly content with a go-nowhere job. He doesn't even want what Ray has a quick itch for; to be on a TV show that will feature his real life 24 hours a day.

To figure out what happens next, Ed. or you, might look in a video store, under Jim Carrey. The ghost of The Truman Show stalks EDtv. and it can't be shaken, as-guess what-Ed is chosen to be in the show. Ray gets jealous. Ray's girlfriend Shari (Jenna Elfman) gets the warms for Ed, instant celebrity makes Ed antsy, and the network's Mephistophelian boss (Rob Reiner) tries to shape the story line of his new star's life, almost as Ed Harris' TV mogul did for Carrey's Truman Burbank.

Note: EDtv isn't copycat filmmaking, exactly. The Howard film-written, with their usual comic clarity, by Lowell Ganz and Babaloo Mandel-is a version of the 1994 Ouebec farce Louis 19, le roi des ondes. But Hollywood, temporarily bereft of original ideas, has become fascinated by its power to create and corrupt. It looks at O.J., Monica, the rubes and rhubarbs on Jerry Springer and asks, with a mixture of self-accusation and self-awe. What have we done?

It's a bit disingenuous for rich and famous moviemakers to tell us how awful it is to be rich and famous on television. As it happens, the moral of EDtv is of less import than its tone-which seems loosey-goosey but is carefully land-mined with gags-and its characters, who are unremarkable but worth getting to know. Shari, for instance, is a woman at profound discomfort in her bountiful body. Ray treats Shari as a gaudy accessory, and she accepts his evaluation. Elfman paints a nice portrait of a woman fighting for esteem. (Psst: she gets it from Ed.)

But McConaughey is the news here, dimples showing through the chin scruff, drawling out punch lines so you don't hear the rim shot, anchoring a film with enough weirdos to populate a Preston Sturges comedy. It's odd that this movie, not a star vehicle, should allow him to radiate star quality, and that's due in part to Howard's gift with actors. But it's more about this actor's sure connection with the character and the camera, and through them, the mass of moviegoers. Here he plays a man with the resources to handle unearned fame. Now McConaughev has earned his own fame

-By Richard Corliss

# **ON NEWSSTANDS** NOW



## GIVE YOUR FEET A LIFT



eet hurt? Really hurt? Chances are you Phave weak or fallen arches. When your arches start to give way the pain spreads from the balls of your feet to your heels, your ankles, your legs, and even your lower back. Introducing IsoArch Foot Supports the affordable alternative to custom orthotics prescribed by podiatrists. Just like the high priced custom orthotics, IsoArch Foot Supports are bio-mechanically designed to provide dual support - across the length of the arch and the ball of your foot - for maximum relief of foot pain and leg fatigue. IsoArch also helps reduce stress at key weight points in the Plantar Pain Zone, keeping each foot properly aligned, cradled and stabiheel insert absorbs the shock impact of each step. Made with a comfortable leather-like covering, IsoArch Foot Supports fit easily into any shoe style, dress, casual, or athletic Specify size using size chart. \$19.95 (\$4.95) per pair. Men #9230, Women #9240. But two pairs and save \$10.00 - \$34.85 (\$4.95)



ORDER TOLL-FREE 24 HOURS A DAY





## Millennium Fevers

In her absorbing new novel, Gail Godwin tracks modern maladies into a mountain town

GAIL GODWIN'S 10TH NOVel, Evensong (Ballantine; 405 pages; \$25), is set in the very near future indeed, specifically the waning weeks of 1999. Millennial fever has reached even the idyllic and remote Smoky Mountain town of High Balsam, N.C. (winter

pop. 1,000), where Margaret Bonner, 33, serves as rector of All Saints Episcopal Church. "Winter in the Great Smokies would shortly be upon us,

Margaret says at the outset of her tale, "the winter that would see us into the next century and the new millennium. Other things were on their way to us as well, things we neither anticipated nor, in some cases, could even imagine. This is the story of how we met them and were changed by them."

As good as her tantalizing opening words. Margaret goes on to recount an extremely hectic four or so weeks in her life. For openers, her six-year marriage to Adrian, 20 years her senior and the chaplain at a nearby experimental school for troubled vouths, seems to be foundering He is depressed, overburdened with work-filling in for the headmaster-founder who has recently died-and physically inattentive. Then there is Tony, an old man in a monk's habit who appears at the rectory requesting lodging. Next comes Chase, a teenager at Adrian's school who was expelled and has nowhere else to go

Finally, a former High Balsam resident named Grace Munger has reappeared in town, hectoring everyone to join the "Millennium Birthday March for Jesus" that she is organizing, spurred on, she claims, by divine inspiration. Much of her bullying is directed at Margaret, who refuses to commit herself or her church to this sort of public demonstration, "We need less display," Margaret lectures Grace, "and more unassuming deeds behind the scenes. Privately, though, Margaret worries, "Am I just being a snob?

If this were not a Gail Godwin novel, the reader's answer might be a rapid affirmative. For Margaret does display some narrative traits that seem to demand an ironic double take. She has the habit, for example, of quoting everyone else's fulsome praise of her: "Oh, Margaret, what a great, great story ... You say such wise things, Margaret ... You're an extraordinary young woman, Margaret." Isn't Margaret a wee bit full of herself? And what to make of this rector's loving inventories of the riches of her church.



OLD-FASHIONED VIRTUES: The author's heroine struggles with the task of being a good person

with Van's grandmother's diamonds and garnets encrusted in the base, and the Georgian silver thurible ...?

But Godwin shows no interest in undercutting or exposing her heroinenarrator. The author has accomplished something more difficult than ridicule; she has created a character who has enough flaws to satisfy contemporary skeptics but who also struggles convincingly with the old-fashioned task of being a good person. For all its leisurely pace, Evensong turns out, near the end, to have wasted few words. It concludes with an Epilogue, set further in the future than its opening chapter, that not only ties up loose ends but also dares to be, in these uncertain times, optimistic. - By Paul Gray



Non-drowsy Allegra, For seasonal allergy symptoms like sneezing, runny note and water, eyes in people twelve and older Side effects are low, and may include drowsiness, cold or flu, nausea or menstrual pain. Ask your doctor or phannacist for more information.

Available by prescription only.

www.allegra.com I-800-Allegra.
© 1999, Hoechst Marion Roussel, Inc.

Please see additional important information on adjacent page. 9825070300267A9

**Hoechst Marion Roussel** 

Hoechst "

#### TELEVISION

FUTURAMA Fox, Tuesdays Should the most biting joke in an animated comedy about Manhattan in the year 3000 be that the city's airport has



show lacks the vision of The Simpsons, the snappy rhythm and the kind of farreaching humor that keep it dizzyingly smart even after a decade on the air. Is there anything good to say about Futurama? Sure, it's better than Two Guys, a Girl and a Pizza. -By Ginia Bellafante

#### BOOKS

IT'S THE STUPIDITY, STUPID By Harry Shearer Got Zippergate burnout? Then read-in fact, buy-this brisk, witty. cheerfully dour screed by Shearer, the radio host (Le Show), protean voice (The Simpsons) and hidden national treasure of political common sense.

Analyzing the hatred some people have for Clinton, Shearer ladles blame and caustic wit on the President, his G.O.P. posse and the moralizing TV newsies with their "hideously bad acting." It's a

smart challenge to lazy thinking. Along with another acerb little volume, Gore Vidal's The American Presidency, it can be taken as an ideal chaser to the recent binge of Monicaholism. Hemlock, -Bu Richard Corliss anyone?

#### THEATER

SNAKEBIT By David Marshall Grant Meet three blind mice: an unhappily married thirtysomething couple-he's a nearly successful actor, she's an actress ignominiously turned brownie baker-and their gay best friend, a former dancer who's now an ineffectual social worker. Smart and smart-

alecky, none of them know how to shift the course of their sorry lives. A young stranger shows up at the Los Angeles bungalow



#### CINEMA

THE CORRUPTOR Directed by James Foley Chow Yun-fat, the epitome of swaggering suavity in John Woo's Hong Kong crime films, wears his role as a good-bad cop dapperly in this good-middling drama



set in Manhattan's Chinatown. He's the tough guy teaming with Mark Wahlberg's sweetly anguished type to battle a local triad. Foley (After Dark, My Smeet) who choreographs the snazziest New York car chase since The French Connection, specializes in close-up portraits of people sweating on the inside. But no matter how dank the moral dilemma. Chow will never break a sweat. In Hong Kong or New York, he's just too cool.

THE KING AND I Directed by Richard Rich Chow's next role is as the King of Siam, opposite Jodie Foster as Anna, in a new version of the story Richard Rodgers and Oscar Hammerstein II musicalized in 1951 and filmed with Deborah Kerr and

Yul Brynner five years later. So who needs another King and I movie? Kids, apparently. So here is an animated feature that ex-



There's some kung fu, a Jafar-style villain with satanic powers, a cartoon menagerie (funny monkey, majestic leopard, etc.), and lame comedy with a crudely drawn, Buddha-shaped fall guy. It's all needless-and harmless. But even with pretty, painterly backgrounds and the eternal lilt of the songs, this film has a limited target audience: six-year-old boys who want to be Michael Crawford. -R.C.



Ongoing coverage of the millennium bug. Until 11:59 on December 31, anyway.

### THE HEALTHIEST HUMIDIFIER YOU CAN BUY



#### THE FIRST AND ONLY HUMIDIFIER THAT DELIVERS 99.99% GERM-FREE WARM MIST VAPOR.

During the winter, you're much more vulnerable to cold and flu viruses and illness caused by such common household bacteria as E. coli. Staphyloccus aureus and others. Fight back with the GF150 Germ Free Humidifier by Slant/Fin - the first and only line of humidifiers that deliver 99,98% germ-free warm mist supor into the parched air inside your home. It is the only humidifier that uses ultraviolet light irradiation and steam evaporation to sterilize the warm water mist. No other humidifier can do that! And, because the GF150 is a warm mist humidifier, there is no white dust to collect on your furniture. The GF150 features a refill indicator light, a manual reset button and a super-quiet fan to deliver germ-free warm vapor mist quickly into the room. Runs for 24-hours on a single 2-gallon rank of rap-water. Add your favorite over-the counter medication, and the GF150 converts to a vaporizer. UL-listed and backed by a 3-year limited manufactures, warrange Prepare less the very dry days of winter with the healthiest humidifier you can buy

\$119.95 (\$13.95) #9292. Special Introductory Offin The GF 350. Same great germ-free performance as above but with a 3.5 gallon dual reservoir capacity, humidistat. peed fan, and UV Replacement Bulb Indicator. \$149.95 (\$14.95) #929



#### ORDER TOLL-FREE 24 HOURS A DAY 800-644-8100 Extension TIMEGS41





Joey McIntyre, an ex-New Kid on the Block, has a solo album, Stay the Same.

Q: So you try to sell your album to Columbia, they say no, you put a single on the internet, it becomes a big hit,

and Columbia comes calling. Don't you kind of hate them now? A: No. If you're going to have a chip on your shoulder in this business, you'll

have no shoulders at the end of the day. Q: Did you know the internet was so powerful? I mean, who are these people surfing around for singles from New

Kids on the Block? A: There are a lot of New Kids websites out there. It's crazy, man.

O: Boston's KISS 108 was the first to play the single. Are you tight with its deciay Matty in the Morning?

A: We play golf, man Q: Golf? Is that really keeping it real?

A: Oh boy. You're something, aren't you? Q: You play a lot of golf?

A: Yeah. I play a lot of golf. You play golf? Q: No. I've gone to a driving range, but I've never played a full game.

A: It's a round, by the way. It's not a game of golf. Just so you can keep it real on the golf tip, G.

Q: Before the new hit, were people still recognizing you on the street from

NKOTB, or are those days long gone? A: I'm able to walk down the street and not get recognized. It took a while to get used to. They're looking at you and you're like, "Are they recognizing me? No, they're just looking at me."

O: How far into dating someone new do you bring up the New Kids thing? A: Usually I don't have to. Sometimes

people want to act like they don't know. Q: What's your favorite New Kids song? Mine's Hangin' Tough.

A: I'd say Please Don't Go Girl.

Q: I don't know that one. A: You'll have to brush up on your New Kids hits, man. -By Joel Stein

### The Moon Watch



The first and only watch worn on the woon



# CANCER.

IT'S AWAR.

THAT'S WHY WE'RE DEVELOPING

316 NEW WEAPONS.

America's pharmacoutical companies are developing 316 new medicines to fight concer—the second leading cause of death in the United States. Gene theorpies, "music bullet" aritholoses, and light-activated medicines are all new wagness in the high-tech, high-takes war against cancer. Pharmaceutical compair researchers have already discovered medicines this area allowing more and more concersarivers to saw, "I want the barde. We hope one day we can all say, "We wan the war."

America's Pharmaceutical Companies

Leading the way in the search for cures

www.searchtoreures.org

**Christine Gorman** 

### **Get Some Sleep**

### Bothered by insomnia? A study says changing your habits is more effective than taking pills

IT'S 2 A.M. AND YOU'VE COUNTED ENOUGH SHEEP TO fill a paddock, but you still can't get the shut-eye you need. Do you a) start counting goats: b) get out

of bed and read; or c) take a sleeping pill? If you picked reading, your restless nights may soon be over. According to a report in last week's *Journal of the American Medical Association*, adopting a few basic habits—like limiting the amount of time you spend in bed—works better than pills or goats in controlling chronic insomnia.

Led by Charles Morin, a professor of psychology at Laval University in Quebec, the I.A.M.A. study is the latest in a series of sleep experiments stretching back 50 years. Much remains mysterious. Despite thousands hours measuring the brain waves of unconscious subjects, monitoring their breathing and noting the effects of sleep deprivation, scientists still don't know the answers to some of the most basic questions.

like why we need to sleep in the first place. That hasn't stopped some wild ideas from gaining popularity. In December, Pocket Books paid a whopping \$200,000 advance for a yet-to-be published book that claims you can lose weight by sleeping longer. (Darn! Why didn't I think of that one?)

But back to reality. Almost everyone experiences a sleepless night or two at some point in their lives. The subjects in Morin's study—all of whom were over age 55—had been fluffing up their pillows in vain for 15 to 20 years. Most of them had no trouble falling saleep. The hard part was saying asleep through the night.

After excluding patients whose insome other tondition, such as depression, researchers condition, such as depression, researchers are assumed from such as depression, researchers groups. One group took the sleeping pill festori. The second group underwent cognitive-behavior therapy designed, sheep habits. The third group reserved both medication and behavior therapy, and the state group took op placebo, or sugar pill.



treated for eight weeks. Not surprisingly, sleeping pills helped test subjects sleep longer right away. But the results were not really different, at least in the short term, from those provided by behavior therapy and the combined treatment. And when the researchers contacted their subjects two years later, only the behaviortherapy group had

maintained its initial

Each of the groups was

recovery. As soon as participants stopped taking sleeping pills.

the sleepless nights returned. How can you improve your chances of getting a good night's sleep? Start by restricting your time in bed to two activities: sleep and sex. If you don't fall asleep within 20 minutes, get up and read quietly in another room so that your brain associates your bed with sleep, not anxiety. Meanwhile, work with your body instead of against it. Don't nap after 3 p.m. Cut back on caffeine, especially in the afternoon or evening. Don't drink alcohol at night; it may allow you to fall asleep more easily but you're likely to suffer a rebound effect in a few hours. Getting up at the same time every morning is also important, because that makes it easier to synchronize your body's biological clock. Whatever you do. don't panic if you become sleepless once again. Most folks find they can't break the cycle of insomnia overnight.

Learn more about the latest sleep research at time.com/personal or www.jama.com. E-mail Christine at gorman@time.com

#### GOOD NEWS

HAPPY HEARTS The antidepressant Zoldt may be
good for the heart aswell as the soul. A preliminary report
suggests that Zolott thins blood in
depressed patients. That's especially
helpful because depressed folks seen
to have blood platelets that climpt together more readly—a major risk factor
to heart attack. Indeed, after taking
with platelets comparable to those of
folks with no sign of the blues.

PROTEIN POWER Scientists have isolated a protein called lysozyme in the urine of pregnant women that seems to be a powerful anti-ADS agent. Though the research is still preliminary, it may explain why niv is rarely transmitted through saliva and tears—where

lysozyme is also abundant. The finding may eventually lead to new, natural therapies against HIV.

#### BAD NEWS

SMOKING GLIM If lung cancer, heard disease and stroke aren't enough to scare you off smoking, maybe this will. A study of 4,000 Danish men shows that mothers who smoke a pack or more a day are fwice as likely to produce criminally violent sors. There even appears to be a dose response: even appears to be a dose response: "Only the control of the switch of the study of the switch of the switc

YO-YO, NO Losing weight and then gaining thack is not just frustrating. It may be down-right harmful. Data on 47,000 women show that ye eye dieting can increase the risk of gallstones. Women who put on and take of 10 los 19 lbs. are 18% more flakely to require gallstone surgery at 20 lbs. or more, the risk shorts up 60%. Gallstones are usually surgery at 20 lbs. or more, the risk shorts up 60%. Gallstones are usually so at 1 feeted by fluctuations in weight.

MCES—Good News, American Psychiacomatic Society meet oceedings of the National Academy of Sciences (3/16/99) Id News, Archives of General Psychiatry (3/199), Areats of ternal Medicine (3/16/99)





**Daniel Kadlec** 

## Divided by 10,000

### It's a big-stock world, but there's unusual value in small companies. Will they ever rally?

DOW 10,000 IS SO WIDELY ANTICIPATED THAT THE media have been writing about it for weeks—even though it's yet to happen. We've had our excuses.

There was the dubious, theoretical 10,000, reached March 12 by adding individual peak prices for each component to come up with Dow 10,043. Never mind that at no point during the day was the average near that level. Then came the modestly credible intraday benchmark last Tuesday, when the Dow briefly traded at 10,002 based on actual prices before

ending the day much lower. On Friday the Dow traded well above the magical mark most of the day, only to sell off again.

I have little doubt that the Dow will close above 10,000 soon, marking its first true breach of the landmark figure and spurring yet another round of news stories repeating what we've already heard:

Dow 10,000 is perfectly meaningless, a number, nothing more. But it all seems like a lot of ink to spill over something that is nothing. In my view, the Number is a red alert to the smoke and mirrors that brought us so far so fast.

No. the stock market will not rocket higher or careen into a dith in use to because the Dow notches a fifth digit. But Dow 10,000 is a critical plateau in that it will be the product of an extraordinary run. If the now had rise not it his historical rate of the year instead of its 24% average annual rise ince 1994, it would now be nearing own and wed be years—not days—from poping the cork. No once cause sywhen this period of outsized gains will end. But the same trends will not last forever.

same trends will not last torever.

Why has the market sourced E. Low inflation, cost-conscious management and endless global opportunities for U.S. companies
have played a lauge role. Those things will
not be considered to the control of the control
possits. But our involved from the control
to the control of the control
to the control of the control
to the control of the control
to the c

Not Keeping Up with the Jones Personal process heat already 1997 Down Jones - Research 2000 - 2000 July 20 sion. Today's most popular stocks trade in that range, and tortured explanations again pass for wisdom.

The Japanese comparison is itself tortured because of our vast cultural and economic differences. Still, Dow 10,000 represents a similar shared trust in the system—a trust that drove Japan to giddy heights and a crushing

heights and a crushing fall. In the Standard & Poor's 500, Morgan Stanley reports that just 15 stocks (3% of the total) accounted for 52% of the index's gain last year. The market "may beging up, but it's almost entirely on the backs of a favored few GE, IBM, Wall-Mart, Merch—all Dow components—along with tech wonders Microsoft, Dell (which I own) and Gisco.

Meanwhile, scores of smaller stocks are "excruciatingly undervalued," as Prudential Securities analyst Claudia Mott puts it. The Russell 2000 small-stock index is down 16% in 12 months. Yet many small stocks have growth rates that exceed their earnings multiples, and the group tends to do best when the U.S. economy is strong and foreign economies are weak, as now. And small companies are ripe for a wave of premium-priced takeovers by big companies using their stratospheric stock prices as currency. Some foreign markets also look attractive. These conditions have been in place for a while; patience is the value investor's cross to carry. Dow 10,000 probably won't alter many investing habits. But that big number has me thinking small

See time.com/personal for more on Dow 10.000. E-mail Dan at kadlec@time.com. See him on CNNfn Tuesdays, 12:45 p.m. E.T.



PRICE CHECK Not long ago, banks were raising fees for checking-account recisioners who kept small balances. It has been considered the tide turning 50 (thanks high stashed monthly charges on its £2 accounts to \$7.50, from as high as \$50 in some states. Nationally, fees average \$9.50. according to Bank Rate Monitor. Washington Mutual, based in Seattle (800-756-8000), often one of the best free-checking deals. For how continued to the commonly banks and credit indicates the continued of the commonly banks and credit checking deals.

SMOOTH SAILING Fidelity's Magellan fund was supposed to have become too big to FIDOWATCH manage. But after stumbling for a couple of years, the nation's largest mutual fund is reasserting itself. Last year the techheavy fund, run by Robert Stansky, beat the soaring S&P 500 with a 33% return. In February, Magellan pulled in nearly \$500 million from investors, its highest monthly net in more than three years.

according to Alpha Equity Research. So

is bigger better again? No, says a study

category, smaller funds generally beat

bigger ones.

by Financial Research: in any given fund

**ALTERNATIVE COVERAGE Massages** and acupuncture may seem like. strange, exotic remedies, but more HMOs are starting to treat them as medicine worth paying for. An estimated two-thirds of the nation's HMOs, in fact, now cover some kind of alternative health care, typically chiropractic, acupuncture or massage therapy, according to a new study by Landmark Healthcare. In the future look for HMOs to expand Percent of coverage for **AOs Offering** ernative Care: vitamin therapy and acupressure, though you may

still have to pay for

kaya or ginkgo out

**Daniel Eisenberg** 

of your own

pocket. -By

HMOs Offering
Alternative Care:
Chiropractic
Apupuncture
Massage Therapy
Valamin Therapy
Herbal Therapy

want to LIVE **D**Lincoln ncoln Financial Group, we provide clear, understandable solutions to be in your new, manage and project the work of a lifetime. Clear relations in a complex world



Joshua Quittner

### **Help-Line Hell**

#### Now that you have to pay for support when your PC goes on the fritz, whom are you going to call?

I COULD TELL AT ONCE THAT SOMETHING WAS TERribly wrong with our home PC. My wife, who is usually so brilliant and unflappable, was suddenly flapped. "Mr. Computer, he doesn't look so good," she sobbed. She took a

seat in the corner, hugging herself and rocking. The poor woman depends on the machine for her work and tends to take its periodic meltdowns hard. The children skittered nearby, cheerfully harassing Otto Quittner, our new puppy, ignoring the crisis in their midst. They knew le. Two hours later, after

5 Daddy would fix the PC. Oh, how I longed for my trusty Macintosh! Macs are easier than PCs in every way, and fixing a software glitch on one is especially simple. (Turn off all the extensions, then turn them back on one by one until you find the offender.) But resolving a PC conflict means entering a time-wasting morass of Washington sex-scandal dimensions. Still, I had no choice. After fiddling around importantly for a bit, I did what I always end up doing in PC-land: I called the 24-hour, toll-free so-called help line. This turned out to be a mistake.

Our Micron PC offered free support a year ago when I bought it. But like most other PC makers, Micron now charges \$24.95 for help with software after 30 days (hardware help is still free). I understand why this has to be. Margins in the PC business are thinner than Bill Gates' smile. Why should any PC maker have to fix the zillions of problems that can arise when consumers install their own software? A few enlightened manufacturers, such as Dell, offer free lifetime support for any software shipped on their machines. As PCs become interchangeable-one box much the same as any other-consumers should choose a vendor on the basis of customer support

That said, I called Micron and waited 45 minutes for the privilege of paying for help. I finally hung up in exasperation. Next night, same thing. The third night, I got someone right away. It was the help-line maître d'. The wait, he said, "might be as long as an hour." It was two. "Is this some kind of record?" I exploded when at last a support guy answered. "Nope," he said with a chuck-

taking me on a hellish tour of "msconfig"-an apparently pointless Windows 98 diagnostic tool-he admitted he couldn't fix the machine. He said I'd need to reinstall Windows 98. When I told him I didn't have my Win98 boot disc (a floppy disc that helps kick-start your machine by

circumventing the hard drive), he said I'd need to reinstall Windows 95, the operating system the machine shipped with, then upgrade to Windows 98. He took my \$25 for this absurdly bad advice

Instead, I should have called Comp-USA, which supports virtually all computers and software. At 1-900-CALL-COMP, you get \$2.49-a-minute help (first minute free) from real pros. I immediately reached someone there who quickly diagnosed my problem as a corrupted registry and told me how to fix it. Kip Crosby, coauthor of the indispensable Windows 98 Bible, later said the registry, a humongous file that helps initialize programs, is often where problems arise. "When it's corrupt, it's almost impossible to repair," he said, noting that hardly anyone in the support world will muck around with it-better to reinstall Windows. Which was what the CompUSA support guy taught me how to do, showing me an easy way to make a Win98 boot disc. Ten minutes and \$25 later. I was well on my way to fixing my machine. Someone still needs to fix Micron's software support, though,

Our website at timedigital.com has more pointers to computer help. E-mail Quittner at jouit@well.com. He may even answer.

**RADIO FREE MICROSOFT The latest** version of Microsoft's Internet Explorer doesn't push Web browsing to any new heights, but it does offer a few bells, whistles and radio knobs. Yes, radio knobs. A new toolbar lets you set up direct links to your favorite Internet radio stations-a trick taken straight from broadcast.com. The browser and radio are free (you can download them from www.microsoft.com). And

sticking with the business practice that landed the company in court, Microsoft plans to sell a new edition of Windows 98 with IE

5.0 bundled in.

REAL CHEAP PCS It doesn't seem that long ago that a good deal on a computer meant a new PC that sold for under a grand. Now the cheapest PC practically pays for itself. The \$299 Webzter Jr. desktop from Microworkz Computer Corp. packs a surprisingly powerful punch with its 300-MHz Cyrix processor, 32 megabytes of

memory and 3.2-gigabyte hard drive. Like every other sub \$1,000 PC, it comes without a monitor, but it does give you one year of free Internet service from Earthlink, a \$240 value.

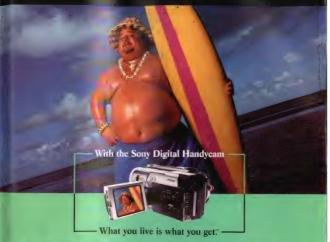


**OUT OF SIGHT Speakers for TVs,** stereos and multimedia computers have been getting pretty thin lately. Now NXT has taken this anorexic trend about as far as it can go: to invisible. The company, based in London, has developed a way to make speakers so transparent that they can overlay any flat surface-PC monitor, TV screen picture frame, even car windshield. A prototype covers a laptop with a vibrating sheet of clear plastic and produces a stereo sound that seems



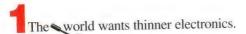
On his first vacation they called him "Kahoola Malocah – White Lightning."

30 years later they call him Big Billy. And he's never looked better.



Now you can play back exactly what you lived with the Sony Digital8 Handycam\* camcorder. We've extended the most popular format. Smm. and made it digital. The Digital8\* "offers better picture quality than VHS or VHS.C\* with twice the sharpness and time times the color information." Plus all Sony Digital8 Handycam camcorders are fully loaded with up to ten hours\* of Stamina\* battery power. LaserLink\* wireless playback. NightShot\* infrared capability that lets you shoot in total darkness, and SteadyShot\* stabilization. It all makes life worth reliving. To order a Video brochure on all Sony Handycam camcorders, call 1-800-295-0093. S495 for shipping and handling. (MC, VISA, AMEX accepted).





We're getting it all on tape.

3M has

pioneered a whole

new technology: Microflex

Circuits - the world's leading

mass-produced electronic circuits on tape.

They're thinner, smaller, highly reliable, and allow for

more connections than rigid circuit boards. They'll go anywhere a

designer can dream up: phones, pagers, laptops and printers. We expand

the possibilities because we make the leap  $from\ need\ to...$ 

**3M** Innovation

Last week was a particularly contentious one among the ranks of the celebrated, providing a veritable folly of feuds. No need to question our judges: there's not a draw among them.

#### Kate Moss vs. Claudia Schiffer



AGE: 25
OCCUPATION: waifish British supermodel

BEST PUNCH: Former Johnny Depp squeeze reportedly called Schiffer's engagement to magician David Copperfield "phony and tasteless," suggesting they were really in love with each other's fame AGE: 28
OCCUPATION: tall German

BEST PUNCH: Used recently rehabbed Moss as the prime example of a group of models who don't take their jobs seriously enough and seem to spend more energy on partying than posing.

WINNER: Moss. In the big wars, Brits always beat Germans

#### Sean Penn vs. Nicolas Cage



AGE: 38
OCCUPATION: Moody artist
BEST PUNCH: Told the New
York Times that "Nic Cage is
no longer an actor. He could
be again, but now he's more
like a ... performer." Later
cited Cage film Snake Eyes as
an example of soulless movie

making

AGE: 35
OCCUPATION: Manic actor
BEST PUNCH: Said onetime
close friend Penn stabbed him
in the back by making nasty
comments a day after visiting
Cage and wife Patricia
Arquette. According to Cage,
"The door to our friendship is
now closed"

NNER: Arquette. She no longer has to host unstable Penr

#### B 1 111 1 B 1 B 1



AGE: varied
OCCUPATION: promoting
football team

BEST PUNCH: Claiming Rosie canceled their appearance on her show after they raised \$81,000 to get to New York City, stormed local media, including Fox News Channel and Live with Rogis & Kathio Lee

AGE: 37
OCCUPATION: promoting celebrities

celebrities

BEST PUNCH: In an on-air
rebuttal claimed the band had
never been confirmed; said she
would not give in to "blackmail"
and called band leader Doug
Harkness "ingenious" but of
ouestionable ethics

ish goof into brush with fame

#### **Courtney Love vs. Marilyn Manson**



AGE: 33
OCCUPATION: singer/starlet

BEST PUNCH: Quit as Manson's opening act over "production problems," but early in the tour stormed off stage after a hostile greeting from Manson fans and told an LA. audience Manson was "evil"

AGE: 30
OCCUPATION: singer/Satan impersonator

impersonator

BEST PUNCH: Repeatedly
apologized to fans for their
having to sit through Love's set;
after Love quit, said, "I think
our fans will be a lot happier
that they don't have to endure
that hour and 15 minutes

th fame Winner: Manson. He exposed Love's thin celebrity skin

TIME, MARCH 29, 1999

231



#### Just Call O.J. at 1-800-RU JOKING Drawing upon his experience

as a professional pitchman (Hertz) and murder defendant (Trial of the Century), O.J. SIMPSON has taped a series of ads for Justice Media, a lawyerreferral service. Simpson says the offer to appear in the television commercials interested him because the ads are aimed at minorities, who often don't have enough money or connections to get first-class attorneys. "The main thing I have learned is you can't walk into a courtroom without competent legal representation," Simpson told the Associated Press. The ads have yet to appear, but Justice Media plans to sell them to participating law firms across the U.S., which can then televise them in their areas. Simpson says he was reimbursed only for his expenses, meaning he will need to find some other form of gainful employment to pay off the \$33.5 million in civil damages he owes to the estates of his ex-wife Nicole and Ronald Goldman, for whose deaths he was found liable.





### Last week gowns worn to bygone Oscar cerei were auctioned at Christie's to raise money for AmFAR.

The following conclusions can be drawn from the results: Fashionably speaking, Liz Taylor's worth dropped roughly 85% in 17 years: her 1969 dress (1) fetched the evening's highest bid, \$167,500, while her 1986 dress sold for \$25,300.

 A good dress is better than a good voice: Madonna's dress (2), the second most expensive of the night, sold for nearly three times as much as Celine Dion's.

■ Marlene Dietrich + Jamie Lee Curtis = Uma Thurman. A gown worn first by Dietrich, then by Curtis (3), netted the same price as one worn by Thurman alone. ■ Some people refuse to get off the Titanic: Kate Winslet's dress sold for \$57,500, the third most exnensive at auction.

Cloris Leachman should eam \$10.5 million for her next film: a Richard Tyler gown worn by Julia Rol who eams \$20 million a picture, sold for \$9.775: Leachman's gown, also designed by Tyler, sold for \$5 175 Nobody beats Diana, At an auction in 1997, the Princess's used gowns averaged \$41,250 a dress;

the Oscar dresses; \$14,037 a dress

#### He's No Rook(ie)

Most chess champions play their first game before age five. MAURICE ASHLEY didn't start until he was 14, but it didn't take long to recognize that he had a knack with a knight. Last week, at age 33, he became the first African-American grand master in history and one of only 45 grand masters in the U.S. He won the title, the highest distinction bestowed by the International Chess Federation, after besting a Romanian grand master at a New York City tournament. The victory came on Ashley's home turf: until 18 months ago, when he joined the professional circuit full time, he coached young players in Harlem. Now he says he would like to open a chess center there but does not plan to settle back into full-time teaching. "I'm still a beginner, as far as I'm concerned," he says. "There's so much to learn."



#### BRING BAYWATCH TO YOUR TOWN

- With various Australian sites looking dead in the water and attempts to frolic in Hawaii possibly beached because of
- Teamsters conflicts, Baywatch is still looking for its next port of call. Executive producer Greg Bonann says no
- decisions have yet been finalized as to where the show will drop anchor next season. In other words, it's not too late to
- bag Baywatch for your hometown, provided it fits the bill:
- Do you have a local plastic surgeon who can perform emergency liposuction/breast augmentation?
- Is it an easy commute for NBA players and rock stars?
- ☐ How large is the local David Hasselhoff fan club? ☐ Is the waxing establishment adept with the male chest?
- ☐ In 20 words or less, describe your local paparazzi.
- Do you have pneumatic locals to serve as extras?

232



Trated with a generous hand, aged parmesan transformed simple eveam into a sauce so deeply satisfying, if warmed the heart on the grayest day. Taste the pasta sauce they inspired CREAMY ALFREDO Five Brothers Commodition One Passion

